Agilent Technologies

Agilent Technologies 8510XF Network Analyzer System

Service Quick Reference Guide

Agilent Part Number: E7340-90013
Printed in USA
Print Date: May 2002
Supersedes: June 2001

Notice

Restricted Rights Legend

If software is for use in the performance of a U.S. Government prime contract or subcontract, Software is delivered and licensed as "Commercial computer sofware" as defined in DFAR 252.227-7014 (June 1995), or as a "commercial item" as defined in FAR 2.101(a) or as "Restricted computer software" as defined in FAR 52.227-19 (June 1987) or any equivalent agency regulation or contract clause. Use, duplication or disclosure of Software is subject Agilent Technologies' standard commercial license terms, and non-DOD Departments and Agencies of the U.S. Government will receive no greater than Restricted Rights as defined FAR 52.227-19(c)(1-2) (June 1987). U.S. Government users will receive no greater than Limited Rights as defined in FAR 52.227-14 (June 1987) or DFAR 252.227-7015 (b)(2) (November 1995), as applicable in any technical data.

Hewlett-Packard to Agilent Technologies Transition

This documentation supports a product that previously shipped under the Hewlett-Packard company brand name. The brand name has now been changed to Agilent Technologies. The two products are functionally identical, only our name has changed. The document still includes references to Hewlett-Packard products, some of which have been transitioned to Agilent Technologies.

Windows ® is a registered copyright of Microsoft corportation.

© Copyright 1998, 2001–2002 Agilent Technologies, Inc

What You'll Find in This Manual…

Chapter 1 Installation "Preflight" Checkout

Chapter 2 Upgrading a Source for 8510XF

Chapter 3 Making 8510XF Adjustments

- Vertical Alignment Adjustment
- Degaussing the Display
- 8360 Series Sources Full User CAL
- Power Level Calibration
  - Detector Gain Cal
  - Conversion Loss Cal

Chapter 4 Performance Verification

Chapter 5 System Level Servicing and Troubleshooting

- Theory of Operation
- Troubleshooting Block Diagrams

Warranty

Certification

Agilent Technologies certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

DOCUMENTATION WARRANTY

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED "AS IS," AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, AGILENT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AGILENT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD AGILENT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

Assistance

Product maintenance agreements and other customer assistance agreements are available for Agilent Technologies products.

For assistance, call your local Agilent Technologies office (refer to "Contacting Agilent" on page v).

Contacting Agilent

Online assistance: `www.agilent.com/find/assist`

United States *(tel)* 1 800 452 4844	**Latin America** *(tel)* (305) 269 7500 *(fax)* (305) 269 7599	**Canada** *(tel)* 1 877 894 4414 *(fax)* (905) 282-6495	**Europe** *(tel)* (+31) 20 547 2323 *(fax)* (+31) 20 547 2390
New Zealand *(tel)* 0 800 738 378 *(fax)* (+64) 4 495 8950	**Japan** *(tel)* (+81) 426 56 7832 *(fax)* (+81) 426 56 7840	**Australia** *(tel)* 1 800 629 485 *(fax)* (+61) 3 9210 5947	**Singapore** *(tel)* 1 800 375 8100 *(fax)* (65) 836 0252
Malaysia *(tel)* 1 800 828 848 *(fax)* 1 800 801 664	**Philippines** *(tel)* (632) 8426802 *(tel) (PLDT subscriber only):* 1 800 16510170 *(fax)* (632) 8426809 *(fax) (PLDT subscriber only):* 1 800 16510288	**Thailand** *(tel) outside Bangkok:* (088) 226 008 *(tel) within Bangkok:* (662) 661 3999 *(fax)* (66) 1 661 3714	**Hong Kong** *(tel)* 800 930 871 *(fax)* (852) 2506 9233
Taiwan *(tel)* 0800-047-866 *(fax)* (886) 2 25456723	**People's Republic of China** *(tel) (preferred):* 800-810-0189 *(tel) (alternate):* 10800-650-0021 *(fax)* 10800-650-0121	**India** *(tel)* 1-600-11-2929 *(fax)* 000-800-650-1101	

Safety and Regulatory Information

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument. This product has been designed and tested in accordance with international standards.

WARNING

The WARNING notice denotes a hazard. It calls attention to a procedure, practice, or the like, that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION

The **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

Instrument Markings

	When you see this symbol on your instrument, you should refer to the instrument's instruction manual for important information.
	This symbol indicates hazardous voltages.
	The laser radiation symbol is marked on products that have a laser output.
	This symbol indicates that the instrument requires alternating current (ac) input.
	The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven.
	The C-Tick mark is a registered trademark of the Australian Spectrum Agency.
	The CSA mark is a registered trademark of the Canadian Standards Association.

1SM1-A	This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4).
	This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB du Canada.
	This symbol indicates that the power line switch is ON.
	This symbol indicates that the power line switch is OFF or in STANDBY position.

Safety Earth Ground

This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Typeface Conventions

Italics

- Used to emphasize important information:
  Use this software *only* with the xxxxxX system.
- Used for the title of a publication:
  Refer to the *xxxxxX System-Level User's Guide*.
- Used to indicate a variable:
  Type `LOAD BIN` *filename*.

`Instrument Display`

- Used to show on-screen prompts and messages that you will see on the display of an instrument:
  The xxxxxX will display the message **`CAL1 SAVED`**.

[Keycap]

- Used for labeled keys on the front panel of an instrument or on a computer keyboard:
  Press **[Return]**.

{Softkey}

- Used for simulated keys that appear on an instrument display:
  Press ***{Prior Menu}***.

`User Entry`

- Used to indicate text that you will enter using the computer keyboard; text shown in this typeface must be typed *exactly* as printed:
  Type `LOAD PARMFILE`
- Used for examples of programming code:

```
#endif // ifndef NO_CLASS
```

`Path Name`

- Used for a subdirectory name or file path:
  Edit the file *usr/local/bin/sample.txt*

Computer Display

- Used to show messages, prompts, and window labels that appear on a computer monitor:
  The **Edit Parameters** window will appear on the screen.
- Used for menus, lists, dialog boxes, and button boxes on a computer monitor from which you make selections using the mouse or keyboard:
  Double-click **EXIT** to quit the program.

Contents

Notice ii
What You'll Find in This Manual... iii
Warranty iv
Certification iv
DOCUMENTATION WARRANTY iv
Assistance iv
Contacting Agilent v
Safety and Regulatory Information vi
Safety Earth Ground vii
Before Applying Power vii
Typeface Conventions viii

1. Installation "Preflight" Checkout

System Overview 1-1
System Diagrams 1-2
Rack Diagram Configured for Coaxial Measurements 1-2
Rack Diagram Configured for Wafer-Probe Measurements 1-3
Front View Cabling Diagram 1-4
Rear View Cabling (rack mounted source) 1-5
Rear View Cabling (table mounted source) 1-6
8510XF Option 006 1-7

2. Upgrading a Source for 8510XF

3. Making 8510XF Adjustments

Procedure 1. Vertical Alignment Adjustment 3-3
Procedure 2. DeGaussing (Demagnetizing) the Display 3-4
Procedure 3. 8360 Series Sources Full User CAL 3-5
Procedure 3A. 8360 Series Sources Modulator Offset and Gain Adjustment (8510XF RF source only) 3-5
Procedure 4. Power Level Calibration 3-6

4. Performance Verification

Verification Overview 4-1
When to Verify 4-1
Materials Required 4-2
Calibration and Frequency Ranges 4-2
Verification Setup 4-4
General Preparation 4-4
Software Installation 4-4
Software Configuration 4-5
Verification Procedures 4-8
Low Band Verification (< 50 GHz) 4-8

High Band Verification (> 50 GHz) 4-10
CW Frequency Accuracy Test 4-12
Materials Required 4-12
Procedure 4-12
Performance Test Record 4-14

5. System Level Servicing & Troubleshooting

Theory of Operation 5-2
Millimeter Wave Controller 5-4
Frequency Bands 5-4
8510XF Firmware Specifications 5-6
Hardware States 5-7
Instrument States 5-7
Power Level Check 5-8
Test Plots 5-10

1 Installation “Preflight” Checkout

System Overview

The 8510XF network analyzer system has been designed to measure broadband devices to 110 GHz, on-wafer or coax, fully calibrated, in a single frequency sweep.

Single RF connection to 110 GHz

The 8510XF system provides frequency coverage from 45 MHz to 110 GHz in a single sweep with a single connection.

Millimeter-wave measurements in 1.0 mm coax

With a single connection, fully error-corrected measurements to 110 GHz are made in 1.0 mm coax. Making millimeter-wave measurements in 1.0 mm coax delivers uncompromised performance and improved productivity compared to waveguide.

Convenient millimeter-wave on-wafer measurements

The 8510XF system is designed for convenient on-wafer measurements using the 1.0 mm coax connector to interface with the 1.0 mm wafer probe.

Broadband calibration with built-in firmware

The built-in firmware of the 8510XF system enables you to perform a single calibration from 45 MHz to 110 GHz, either in coax or on-wafer.

System Diagrams

Rack Diagram Configured for Coaxial Measurements

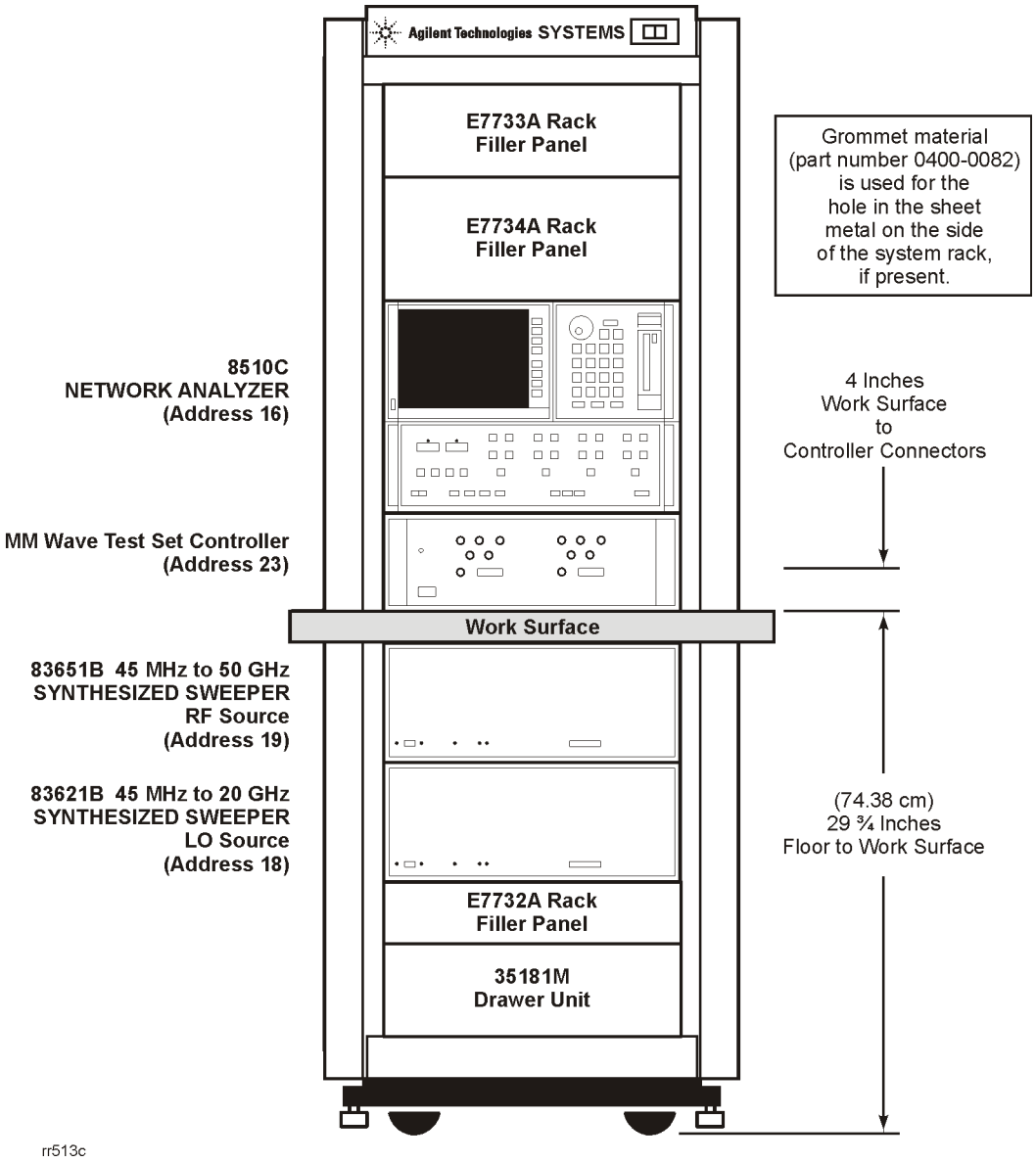


Figure 1-1 Rack diagram configured for coaxial measurements

Rack Diagram Configured for Wafer-Probe Measurements

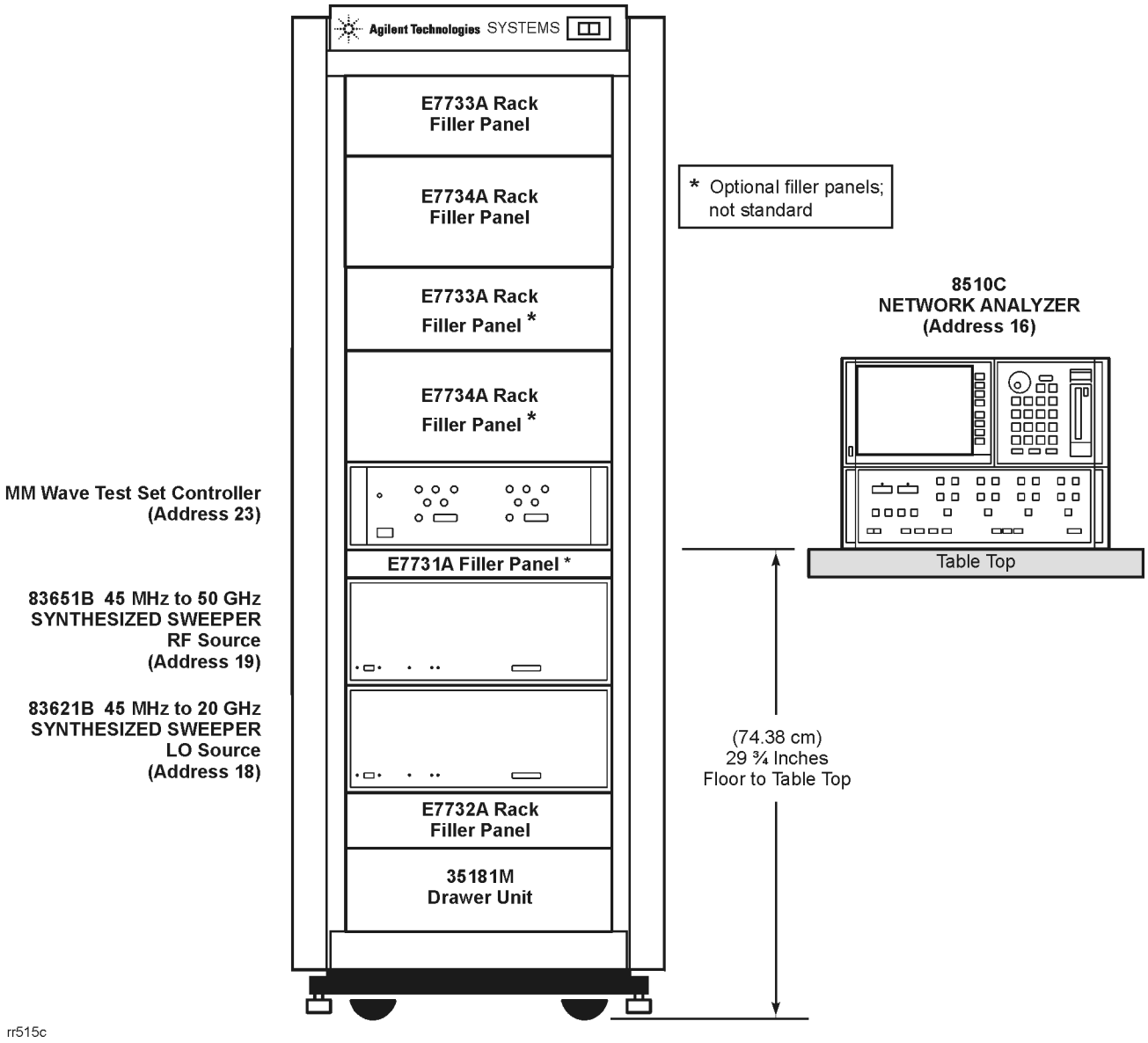


Figure 1-2 Rack diagram configured for wafer-probe measurements

Front View
Cabling Diagram

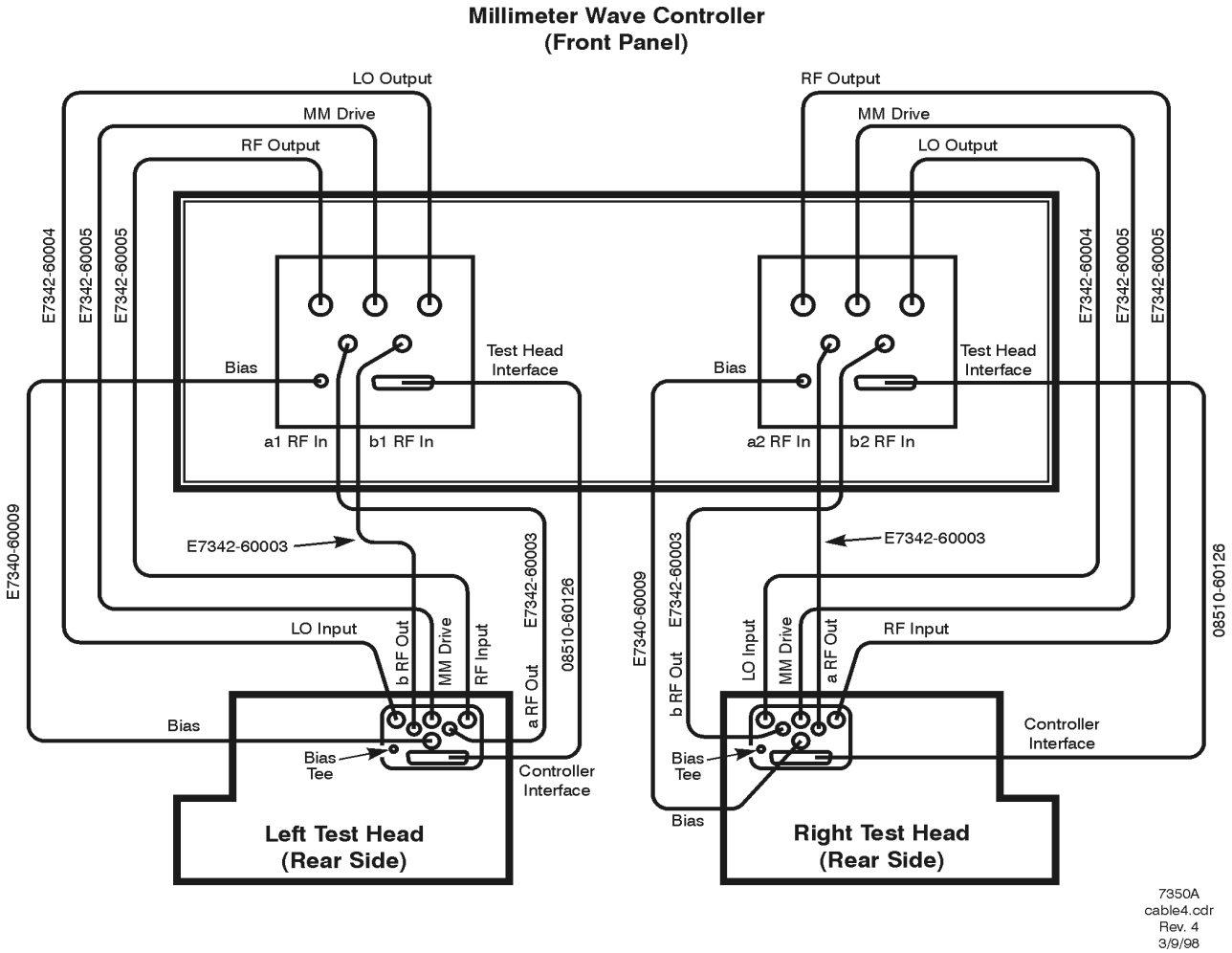


Figure 1-3 Front view wiring diagram

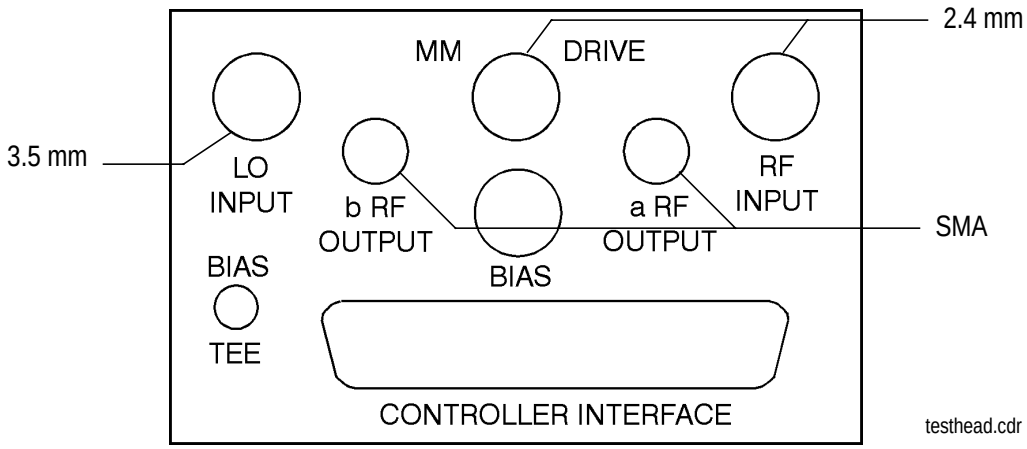


Figure 1-4 Test head connectors

Rear View Cabling (rack mounted source)

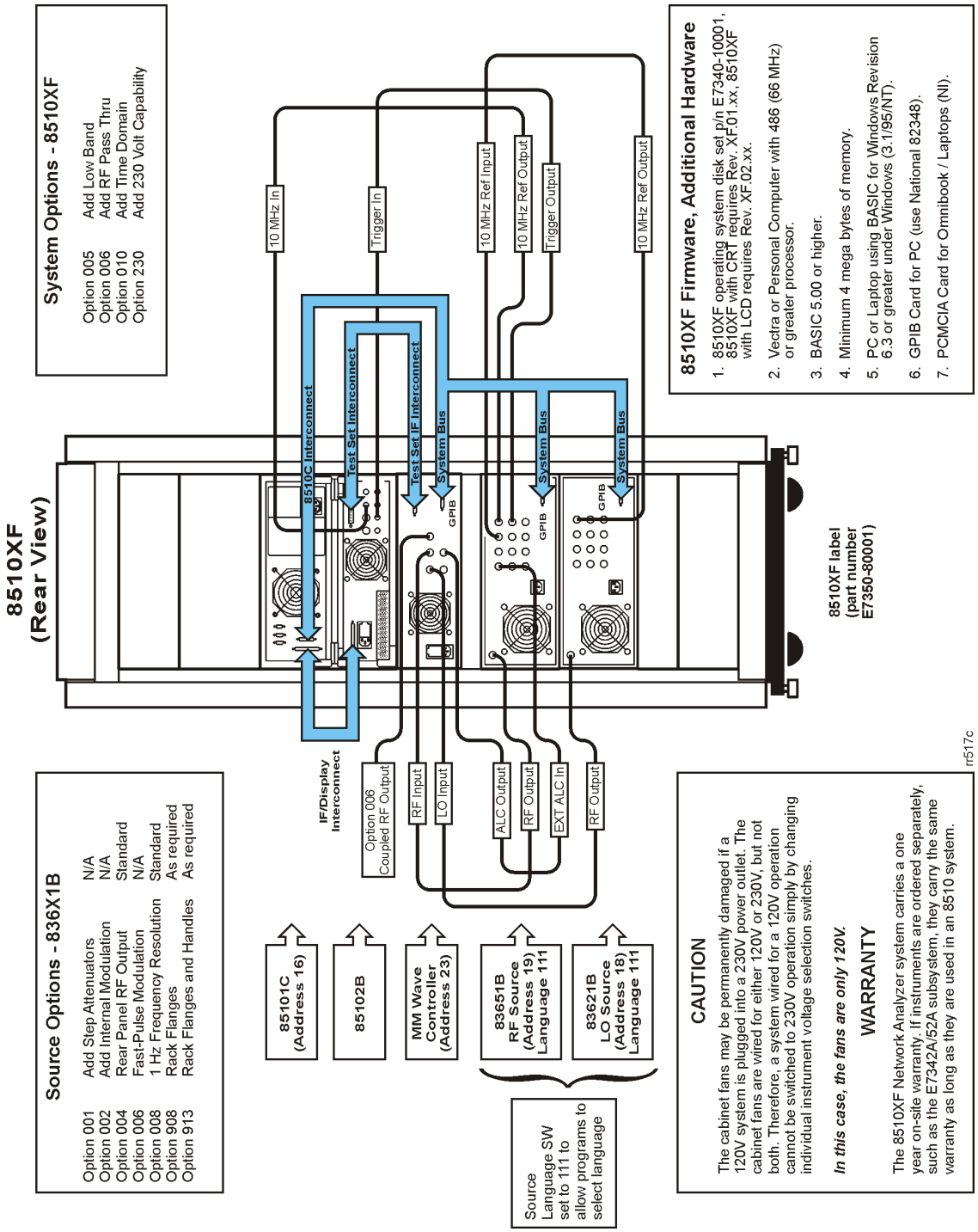


Figure 1-5 Rear view wiring diagram (rack mounted source)

Rear View Cabling (table mounted source)

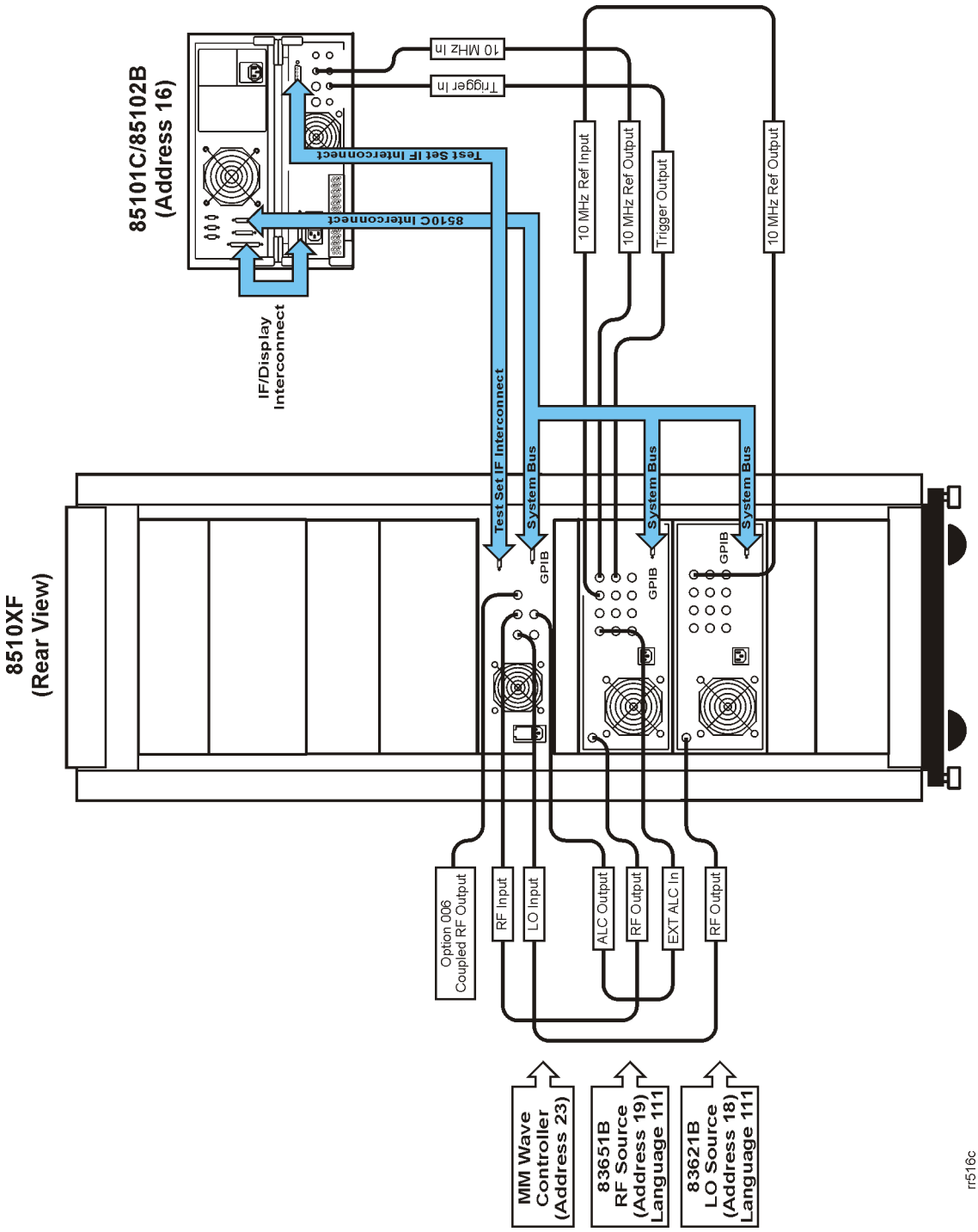


Figure 1-6 Rear view wiring diagram (table mounted source)

8510XF Option 006

8510XF Option 006 provides the capability to add an additional 8510 series test set provided Option 001 is installed in the test set. Option 006 includes:

- Coupler and amplifier added to millimeter-wave controller
- 2.4 mm termination added to rear panel

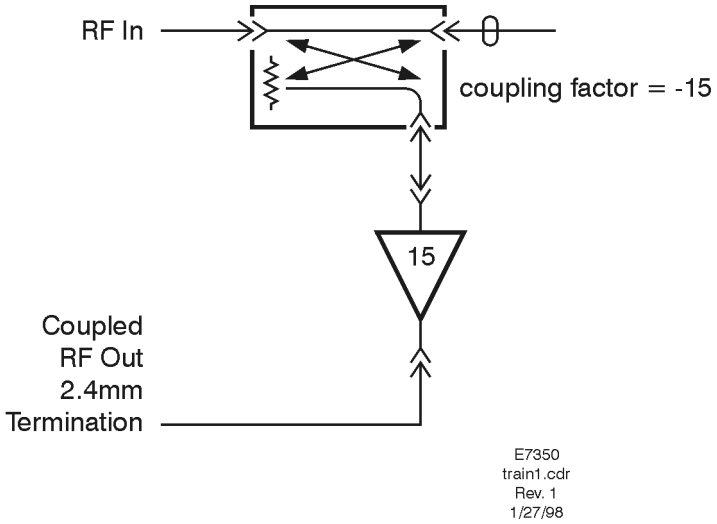


Figure 1-7 8510XF Option 006

The configuration for the 8510XF Option 006 is as shown in Figure 1-8.

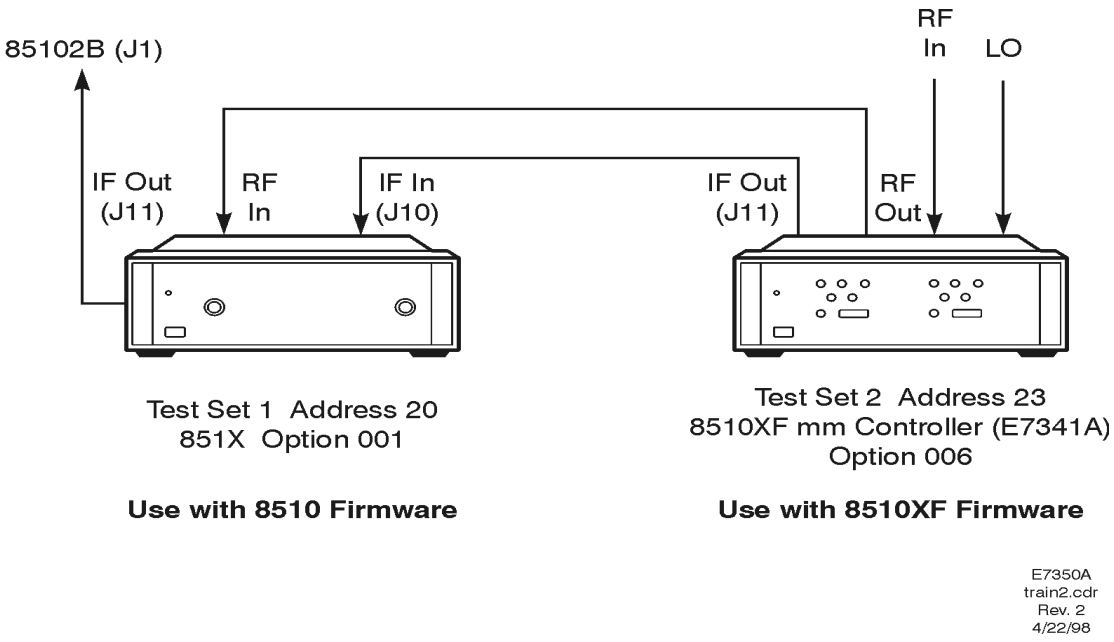


Figure 1-8 Multiple test set example application

2 Upgrading a Source for 8510XF

All 8360 series sources are compatible, but only the 83621A/B or 83651A/B are recommended in order to insure full functionality of the 8510XF. Table 2-1 shows the upgrade options required.

NOTE

83651/21A and 83650/20A/B will also work for upgraded 8510XF systems as long as it has test port flatness correction modification or capability, rear panel output (Option 004), and 1 Hz frequency resolution (Option 008) installed.

Table 2-1 Source Upgrades

Model	Maximum Power at Highest Frequency	Serial Prefix	Required for Test Port Flatness Correction
83620B/21B 83650A/B 83651A/B	+ 13 dBm + 2.5 dBm + 2.5 dBm	All	No modification required. [1]
83621A [2] 83631A [2]	+13 dBm + 10 dBm	< 3103A 3103A 3104A to 3111A ≥ 3112A	83601A upgrade kit.[3] 08360-60167 firmware kit 08360-60201 firmware kit No modification required. [1]
83620A [2] 83623A [2] [4] 83624A [2] 83630A [2] 83640A [2]	+ 13 dBm + 17 dBm + 20 dBm + 10 dBm + 26 dBm	≤ 3103A 3104A to 3111A ≥ 3112A ≥ 3145A	08360-60167 firmware kit 08360-60201 firmware kit No modification required. [1] No modification required. [1]

1. Fully compatible at time of shipment.
2. Can be used for 8510XF LO source when upgraded and includes Options 004 and 008.
3. Includes installation.
4. 83623L, 30L, 40L and 50L, with Option 004 and 008, will also work as LO source, but do not have modulation capability (83623L maximum power at highest frequency is + 15 dBm).

3 Making 8510XF Adjustments

NOTE

This chapter covers both the CRT and LCD displays. Some display-related adjustments apply only to instruments with CRT display.

The following table provides adjustments most frequently needed for 8510XF system service. Most of the 8510XF is self-adjusting except for the following:

Table 3-1 Frequently used 8510XF adjustments

Procedure[1]	Title	Adjustment Function	Assembly Adjusted
1	**Vertical Alignment Adjustment[2]**	Aligns softkey labels and mechanical softkey buttons.	A11
2	**Degausing (Demagnetizing) the 85101 display[2]**	Demagnetize the display.	
3	**8360 Series Sources Full User CAL**		
4	**Power Level Calibration**	Insures level power at the test ports	Leveling DAC/ EEPROM, A16, and Leveling Compensation Board, A7

1. Reference subsequent sections in this document.

2. These adjustments apply to a CRT-based display only.

Table 3-2 Equipment required for 8510XF adjustments

Equipment	Recommended Model	Substitute
CRT demagnetizer or bulk tape eraser[1]	Radio Shack Model 44-233 Techno Tool (USA) or Nietronix (Europe) 692PR022	1 to 2 amp pencil sharpening motor (base held near CRT with motor on), or electric drill
Flat-head screwdriver (small)	At least 2 inches long, non-conductive	none
10 dB pad	8493C	8360 series source with built-in attenuator
85102A/B and test set adjust software	Part Number 08510-10024	Rev. A.01.10
Power Meter	437B power meter	438A or EPM-441A power meter
Power Sensors:		
	8481A or 8482A	N/A
50 GHz	8487A power sensor	N/A
V band	V8486A power sensor	Only available as a special
W band	W8486A power sensor	N/A
Adapter, 2.4 to 1.0 mm (f-f)	85059A K01	
Adapter, V-band to 1.0 mm (f-f)	V281C	
Adapter, W-band to 1.0 mm (f-f)	W281C	
Laptop, personal computer or controller [2, 3]	9000 series 200 or larger	
8510XF port power level calibration check software	08510-100xx	
BASIC 6.3 or higher[4]	E2060B	
Agilent VEE 4.0 Installation	E2120-13605	

1. These adjustments apply to a CRT based display only.
2. Minimum 4 megabytes of available memory after BASIC has been loaded.
3. With BASIC for Windows and PCMCIA-GPIB card.
4. Includes language extensions and drivers.

Procedure 1. Vertical Alignment Adjustment

NOTE This procedure applies to a CRT based display only.

NOTE The vertical alignment can be affected by magnetic interference. Before adjusting the vertical position, be sure the analyzer is in a non-magnetic environment and the CRT is degaussed.

Perform the following steps to adjust the vertical alignment.

1. Switch on the system and allow it to warm up for 60 minutes.
2. Remove the side panel nearest the display to access the vertical position and focus controls. See Figure 3-1.
3. Insert a narrow, non-conductive, flathead screwdriver (2 or more inches long) into the vertical position hole.
4. Adjust the control until the softkey labels align with the softkeys.

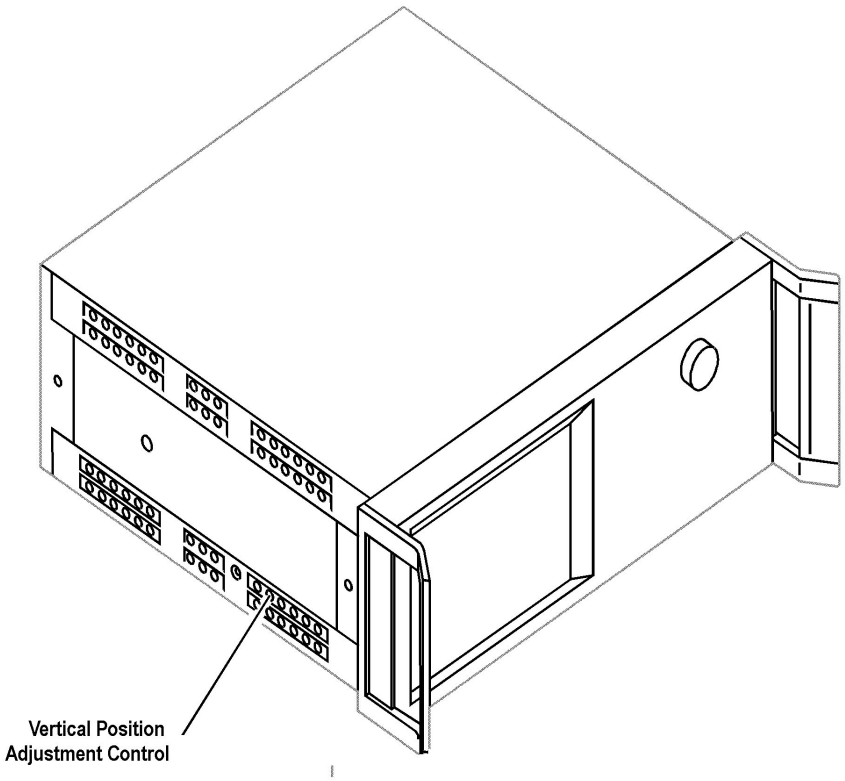


Figure 3-1 Vertical adjustment location

Procedure 2. DeGaussing (Demagnetizing) the Display

NOTE

This procedure applies to a CRT based display only.

Use any CRT demagnetizer or bulk tape eraser for this procedure. The color monitor display is very susceptible to external magnetic fields, such as metal frame tables, welded cabinets, the earth, unshielded motors, and other sources. The usual symptom is discoloration or slight dimming of the display (usually near a top corner of the CRT). In extreme cases, a total color shift may be observed. For example, a trace that was red may shift to green. This shift does not suggest a problem with the display. It is characteristic of color displays needing demagnetizing. In countries using 50 Hz, some 10 Hz jitter may be observed. If this problem is observed, remove the device causing the magnetic field.

If the display becomes magnetized or if color purity is a problem, cycle the power several times. Leave the instrument off for at least 15 seconds before switching power on. This will trigger the automatic degaussing circuit in the display. If this is insufficient to restore color purity, use a commercially available demagnetizer (either a CRT demagnetizer or a bulk tape eraser). *In an emergency, you can use a running electric drill or a pencil sharpener that draws 1/2 to 2 amps through its AC motor winding.* Follow the manufacturer's instructions keeping in mind that it is imperative when demagnetizing a display that the degausser is kept *farther than 4 inches* (10 cm) from the face of the CRT. Generally, degaussing is done with a slow rotary motion of the degausser, moving it in a circle of increasing radius while simultaneously moving away from the CRT. The following figure illustrates the motion for degaussing the display.

CAUTION

Applying an excessively strong magnetic field to the CRT face can permanently destroy the CRT.

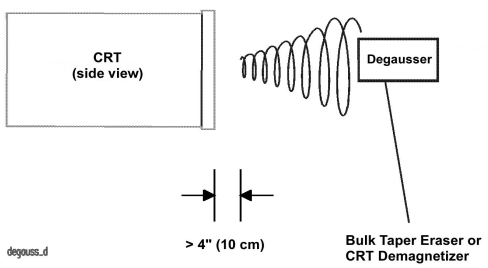


Figure 3-2 Using a Degausser on the display

Procedure 3. 8360 Series Sources Full User CAL

Full User CAL initiates a full synthesizer calibration. The calibration performed is instrument state dependent. For example, if the synthesizer is in ramp sweep mode, a sweep span and an auto track calibration are performed. If the synthesizer has amplitude modulation active on an SW signal, then RF peaking and AM bandwidth calibrations are performed. For 8510XF purposes, only ramp-sweep mode is needed.

Perform the following calibration procedure:

1. On the 8360, press **[PRESET] [USER CAL].**
2. Select ***{Full User CAL}***. Wait for the calibration to complete (usually less than a minute).

Attenuation needed

If the 8360 series source does not have a built-in attenuator, you will be prompted to connect a 10 dB attenuator to the 8360 series RF output port. Auto track is done as part of Full User CAL.

NOTE

If the 8360 series source does not have a front panel, use the 8360 source front panel emulator in the 8510C network analyzer (refer to the “Service Program” section in the *8510C On-Site Service Manual*). For the RF source calibration, the front-panel emulator will default to GPIB address 19. For the LO source calibration, change the GPIB address in the front panel emulator to 18.

Procedure 3A. 8360 Series Sources Modulator Offset and Gain Adjustment (8510XF RF source only)

Modulator offset and gain adjustment optimizes the modulator in the 8360 series source for maximum performance. This is necessary since the RF source is part of the 8510XF level control (refer to Figure 3-3 on page 3-6). This should be done before the conversion loss calibration is performed on systems with older sources or sources which may be out of calibration.

Adjust the RF source using the procedure “Modulator Offset and Gain Adjustment” in the 8360 Series Synthesized Sweeper Service Guide’s “Adjustments” chapter.

Procedure 4. Power Level Calibration

Power level calibration insures leveled power at ports 1 and 2. To level the power, we sense the IF signal which correlates to RF level. Since the translation function is frequency dependent, we need to measure the translation function using the conversion loss calibration procedure. The power level calibration is accomplished using IF leveling as shown in the following circuit.

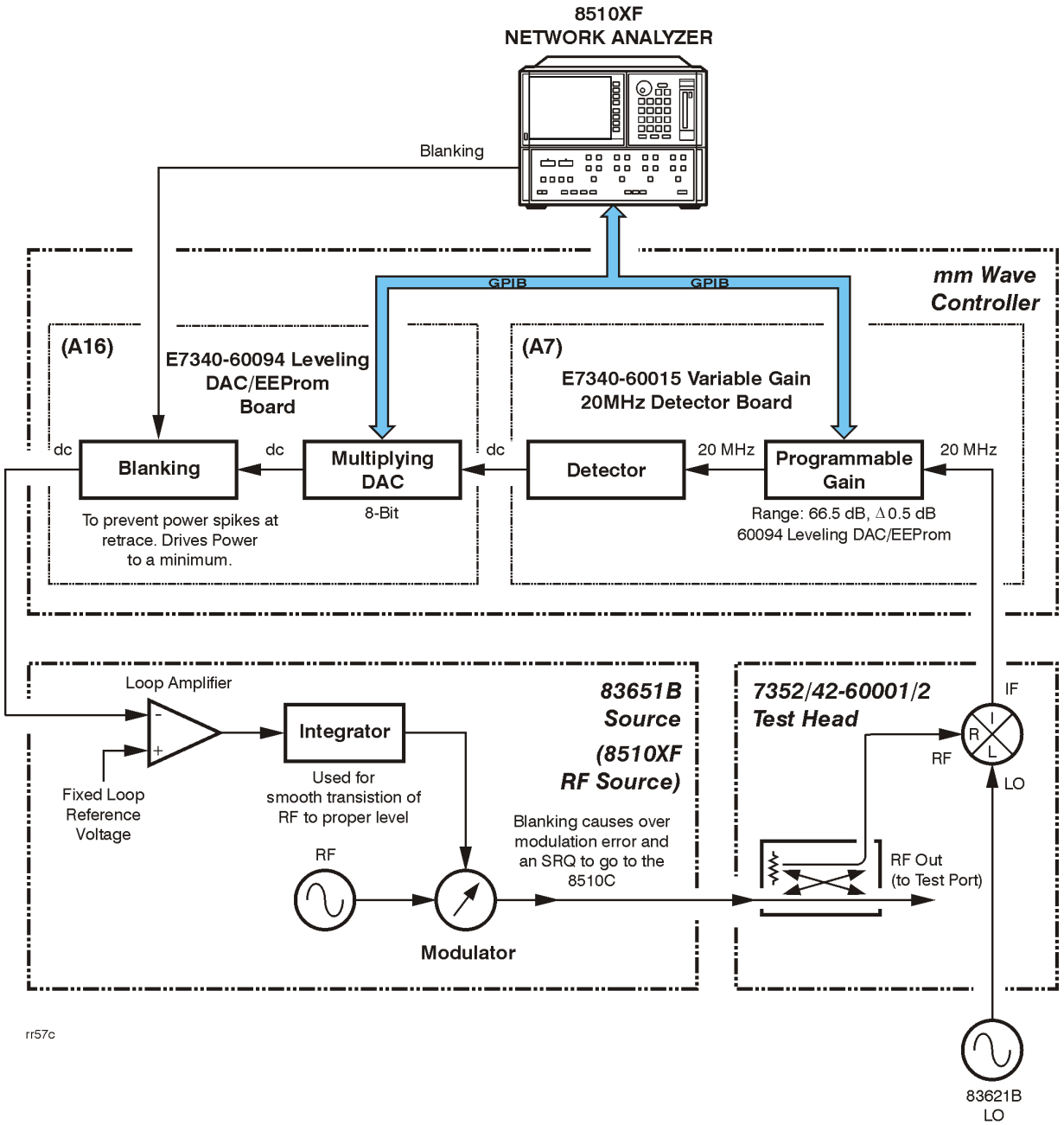


Figure 3-3 8510XF level control

Detector Gain Cal

Before we begin the conversion loss calibration, we must perform a detector gain calibration to compensate for the imprecision of the detector board (E7340-60015 A7). Perform the following procedure for the detector gain calibration:

1. Under the **Auxiliary Menus**, press **[System]** hard key.
2. Press ***{More}*** softkey.
3. Press ***{RF Power Config}*** softkey.
4. Press ***{More}*** softkey.
5. Press ***{Reset Det Gain Cal}*** softkey.
6. Follow the on-screen instructions until cal is completed.

CAUTION

If the operating system is reloaded, it is necessary to perform the detector gain calibration.

NOTE

It is recommended that this 5-minute calibration be performed once a month. Additionally, a CW frequency accuracy test should be performed prior to doing the conversion loss and power level flatness calibrations. Refer to "CW Frequency Accuracy Test" on page 12.

Conversion Loss Calibration

After performing a detector gain cal, you will be ready to perform the RF to IF conversion loss calibration. This calibration provides the absolute power level information at 25/50 MHz intervals over the entire frequency range of the E7340/50A to compensate for conversion losses in the E7340/50A so that ports 1 and 2 will be power leveled.

a. The external controller with its software changes the 8510XF CW frequency and reads the power meter.

b. The entire frequency range is stepped in 25/50 MHz increments at approximately 2200 points per port (25 MHz steps from 45 MHz to 18 GHz, and 50 MHz steps from 18 GHz to 110 GHz).

c. The result is stored in the millimeter controller EEPROM memory board (A16) after all bands and heads are measured and should be valid for one year or until a test head is repaired or replaced.

To perform the conversion loss calibration:

Use the following procedure to perform the conversion loss calibration.

1. Load the BASIC, version 6.3 or greater.
2. Calibrate and zero the power sensor, and enter all cal factors versus frequency of the 3 or 4 sensors into the text file of the conversion loss calibration program.
3. Connect the power sensor to the left or right test head and press **[ENTER]**.
4. Create a power sensor cal factor test file. Using MS Windows Notepad, enter the following values in the respective columns:

Column	Entry
First	Frequency (GHz)
Second	Cal Factor
Third	Sensor #3

   Save this file as `XFPWRCAL.PMC`, and in the same directory as your conversion loss cal program.

5. Load `xfpwcal.bas`, and press **[ENTER]**.
6. Press ***{Run}***.
7. Select one of the following frequency ranges:

Selection	Frequency Range
1	0.045 to 110 GHz
2	2 to 110 GHz
3	0.045 to 85 GHz
4	2 to 85 GHz

8. Select (1) for the left test-head, or (2) for the right test-head.
9. Enter the serial number of the test head up to eight digits.
10. Approximately 20 frequencies will be used to check the 8510XF power control. These frequencies and the corresponding levels will be displayed if all is okay. If not, the display will have an error message which indicates that the 8510XF leveling loop must be corrected.

NOTE

Refer to **Performance Verification**, page 4-1, for details on the types of computers and software needed to run the Performance Verification and conversion loss calibration programs.

4 Performance Verification

Verification Overview

NOTE

The verification procedures in this chapter work for all 8510 and 8510XF hardware configurations by substituting the proper 8510 source, test set, accessories, and millimeter wave controller.

Performance verification software Rev. A.05.00 or greater will be available only in DOS format, and will work with laptops or PCs that have the required accessories installed. Refer to "Materials Required" on page 4-2.

When to Verify

After installation of the system is complete, a performance verification is necessary to assure proper system operation. This initial verification is included with the installation.

After the initial verification, the verification should be repeated once a year. This recommended interval assumes that Agilent cables are used with the system.

If non-Agilent cables, adaptors, or other fixtures are used, the verification schedule must be determined by the user, as the characteristics of these devices are unknown. In establishing a verification schedule, the following factors should be considered:

- Frequency of use
- Amount of cable movement
- Amount of drift occurring between prior verifications

NOTE

Performance verification of a system performed at long intervals is *not* to be confused with measurement calibration. Measurement calibration typically is performed on a daily basis, or when measurement setup or conditions have changed.

Materials Required

The following materials are required to run the tests:

- 8510XF system with accessories
- 85059A 1.0 mm Precision Calibration and Verification Kit
- PC-based, 8510 Specification and Performance Verification Software (Rev. A.05.00 or greater; p/n 08510-10033)
- Laptop or PC running BASIC for Windows (3.1/95/NT) (Rev. 6.3 or greater)
- GPIB Card for PCs (National Instruments or HP)
- PCMCIA Card for Omnibook or laptop
- GPIB cable from PC to 8510XF

Calibration and Frequency Ranges

The 8510XF requires separate verifications for frequencies below and above 50 GHz (see on "Frequency ranges" on page 4-3).

A special two-band calibration procedure is required for the performance verification of the 8510XF system (a measurement calibration is *not* sufficient). There are up to three different calibrations and corresponding frequency ranges required, which are stored in suggested locations in the 8510 analyzer (Refer to Table 4-1). For more information refer to the section on "Frequency ranges" on page 4-3. The parameters for these calibrations are set up automatically on the analyzer by the performance verification software.

Table 4-1 Calibration storage locations

File Location Name:	Frequency Range of Data Stored:
Cal Set 1	1-50 GHz[1] (2-50 GHz)[2]
Cal Set 2	45 MHz[1]
Cal Set 3	50-110 GHz[3]

1. This calibration is for Option 005 systems only.
2. The frequency for standard systems is 2-50 GHz.
3. The frequency range shown is for the E7352A system only. The E7342A system's frequency range will be: 50-85 GHz.

Frequency ranges

For most of the menu items in the software, there are two or more selections that pertain to the 8510XF. These menu selections are differentiated by:

A. The frequency range of the millimeter wave subsystem

- E7352A: 110 GHz subsystem
- E7342A: 85 GHz subsystem
- Option 005: 45 MHz to 2 GHz

B. The portion of the subsystem's frequency range that is being verified (the ranges above and below 50 GHz are verified separately).

The menu selections are broken down in Tables 4-2 and 4-3, below.

Table 4-2 System hardware configuration (E7352A -- 110 GHz System)

Hardware	Selection (<50 GHz Range)	Selection (>50 GHz Range)
Network Analyzer	8510C -- Vector Network Analyzer	8510C -- Vector Network Analyzer
Test Set	E7352A -- 1.0 mm Subsystem (2-50 GHz) E7352A005 -- 1.0 mm Subsystem (45MHz-50GHz)	E7352A110 -- 1.0 mm (50 GHz-110 GHz)
Source	8365xXF -- Synthesizer (45 MHz-50 GHz)	836xxXF -- Multiplied Synth. (above 50 GHz)
Calibration Kit[1]	85059A -- 1.0 mm (45 MHz-50 GHz) [Use w/ E7342A/52A]	85059A110 -- 1.0 mm (50 GHz-110 GHz)
Calibration Technique	BL -- Broadband Load Cal	OS -- Offset Short Cal
Test Port Cables	DIRECTXF -- for 8510XF verification (1.0 mm-1.0 mm)	DIRECTXF -- for 8510XF verification (1.0 mm-1.0 mm)
Verification Kit	85059AOV -- 1.0 mm (45 MHz-50 GHz)	85059AOV110 -- 1.0 mm (above 50 GHz)

1. The 85059A --1.0 mm (45MHz-50GHz) [Use w/ 8517A/B] selection is not used for the 8510XF Performance Verification.

Table 4-3 System hardware configuration (E7342A -- 85 GHz System)

Hardware	Selection (<50 GHz Range)	Selection (>50 GHz Range)
Network Analyzer	8510C -- Vector Network Analyzer	8510C -- Vector Network Analyzer
Test Set	E7342A -- 1.0 mm Subsystem (2-50 GHz) E7342A005 -- 1.0 mm Subsystem (45 MHz-50GHz)	E7342A85 -- 1.0 mm (50 GHz-85 GHz)
Source	8365xXF -- Synthesizer (45 MHz-50 GHz)	836xxXF -- Synth. (above 50 GHz)
Calibration Kit[1]	85059A -- 1.0 mm (45 MHz-50 GHz) [Use w/ E7342A/52A]	85059A85 -- 1.0 mm (50 GHz-85 GHz)
Calibration Technique	BL -- Broadband Load Cal	OS -- Offset Short Cal
Test Port Cables	DIRECTXF -- for 8510XF verification (1.0 mm-1.0 mm)	DIRECTXF -- for 8510XF verification (1.0 mm-1.0 mm)
Verification Kit	85059AOV -- 1.0 mm (45 MHz-50 GHz)	85059AOV110 -- 1.0 mm (above 50 GHz)

1. The 85059A --1.0 mm (45MHz-50GHz) [Use w/ 8517A/B] selection is not used for the 8510XF Performance Verification.

Verification Setup

General Preparation

Prepare for performance verification by completing the following steps:

1. Measure the environment temperature and humidity. The temperature must be between +20 °C and +26 °C. Additionally, the temperature cannot vary by more than 1°C after calibration.
2. Perform a good installation “preflight” checkout on the 8510XF system.
3. Power on the system components in the following order:
   a. Sources
   b. Millimeter wave controller
   c. 8510XF
   d. Controller (PC or laptop)
4. Remember to allow at least one hour for warm up of the components.

Software Installation

In order to verify performance, you must first install BASIC for Windows and the 8510C Specification and Performance Verification software on a PC (or controller).

NOTE

This manual documents the use of the verification software on a PC. Use of the software on a controller is not documented.

The PC must have an INTEL 486 processor or higher, and must have at least eight megabytes of memory available. The PC must also have an GPIB card in order to communicate with the 8510XF.

1. Install BASIC for Windows (Revision 6.3 or later) on the PC following the instructions on the first BASIC disk. The program will guide you through the installation process. (For more detailed information, refer to *BASIC for Windows, Installing and Using Guide*.) If you are installing Revision 7.1 or later, install the Legacy Version.
2. Install the specification and performance verification software by following the instructions on the disk label. The installation program will lead you through the installation. In the process, a new program group will be created, which includes the “Spec8510” icon.

NOTE

Rev. A.05.00 or greater of the performance verification software is backwards compatible. So, it is acceptable to replace the older version you have on the PC.

3. Run the program by clicking on the "Spec8510" icon or selecting: **Start**, **Programs**, **8510**, **Spec8510.** The following warning messages will be displayed:

   A valid Basic for Windows GPIB driver for your board (if any) has not been loaded. You can run the Specifications and Uncertainty portions of the 8510 software but can not run the Verification portion as this requires communication. Press CONTINUE to load and run the 8510 software without GPIB or:

   To load the correct driver EDIT this program and Remove the "!" from in front of the LOAD statement for your GPIB board.

   After editing, type RE-STORE "AUTOST" to store the modified program. Then, close this window and re-select the Specifications and Verification icon to re-run the program. The 8510 software should now load and run.

4. Edit the AUTOST program according to the instructions in the warning message. (However, if you do not want to run the verification portion of the software, you can skip this step by selecting **CONTINUE**.)

NOTE

For additional information on running the system specifications, system uncertainty, and edit system specifications portions of the program, refer to the "Performance Verification and Specifications" chapter in the *8510C On-Site Service Manual*.

5. After editing and storing the **AUTOST** file, exit the program by closing the window and then restart the 8510 Specification and Performance Verification Program.

Software Configuration

NOTE

Once the Specifications and Verification Software is running, there is no *functional* difference between operation on a PC and operation on a controller.

1. Verify the GPIB cable is connected from the PC to the GPIB bus (also referred to as the public bus) on the analyzer.
2. After the program is started, the program title (8510 Specifications and Performance Verification Software) and copyright notices are displayed. Select **RESUME**.

3. A screen prompt will give you the opportunity to set the date and time. Press the **[Y]** key on the PC to skip this step, or press **[N]** to set the date and time.
4. The program loads the System Configuration file, and displays the System Hardware Configuration Menu. Use this menu to specify the equipment you are using, and the frequency range you are verifying (refer to "Frequency ranges" on page 4-3).

   To set up for the first performance verification, select the proper hardware setup for Low Band Verification (< 50 GHz) using Table 4-2 on page 4-3 for the E7352A 110 GHz system, or Table 4-3 on page 4-3 for the E7342A 85 GHz system.

   a. Select **NEXT** or **PREVIOUS** to step through the list of selections for each menu item.

   b. Use the up and down arrow keys on the PC to advance from one menu item to another.

   c. Select **DONE** when you have made a selection for each menu item.
5. The main menu is displayed (see Table 4-4).

Table 4-4 Main menu

Softkey	Description
System Config	System Hardware and Software Configuration Menu
System Specs	System Spec Table Menu
System Uncert	System Uncertainty & Dynamic Accuracy Plot/Table Menu
Edit Specs	Edit the System Specifications
Verify System	System Performance Verification Menu
Quit Progam	Quit this Program

Printer selection

1. From the Main Menu (choosing printer options):
   a. Select **System config**.
   b. Select **Software Config**.
   c. Select **Printer Connected to:**
2. Select printer output choice (refer to Table 4-5)

Table 4-5 Printer table of selections

Printer Connected To:
GPIB
WIN Printer[1]
LPT1
LPT2
File[2]

1. Windows default printer
2. Under Printer Redirection (File): Verify directory path exists before entering name of path

3. Select **Done** and **Previous Menu** to return to Main Menu.

Verification Procedures

Low Band Verification (< 50 GHz)

The following steps assume the hardware configuration has been previously setup for Low Band Verification (< 50 GHz) in step 4 on page 4-6 under Software Configuration.

1. From the Main Menu select **Verify System** to go to the System Performance Verification Menu.
2. Select **Serial Numbers** to enter serial numbers of system and components.
3. Select **System Cal** and follow the program prompts to calibrate the system for frequencies <50 GHz. See Table 4-1 on page 4-2 for the calibrations required and suggested calibration storage locations (also refer to the "Two-Band Calibration Procedure for 8510XF Performance Verification" art foldout at the end of this chapter).
   a. Install the 1.0 mm female to female cable (8.8 cm, part number 11500-60001) onto the right test head (port 2) prior to calibration. This cable is part of the 85059A 1.0 mm Precision Calibration and Verification Kit and is considered to be a *test port* cable.
   b. A full two-port calibration is required. A table of calibration standards required for each frequency range can be found in the 85059A 1.0 mm precision calibration and verification kit manual, or on the art foldout at the end of this chapter.

CAUTION

Do *not* remove this test port cable once the Calibration/Verification process has begun. If the test port cable becomes loose or is removed during the calibration/verification process, the calibration is *invalid*.

CAUTION

Do not pull on the connectors on the ends of the test port cable—this will damage the cable. Avoid damaging the cable once it is connected to port 2 by carefully making the thru connection between the two test heads. This is best done by placing the two test heads on a smooth surface and gently sliding the right test head (port 2) towards the left test head (port 1).

c. To make the thru connection, gently slide the right test (port 2) towards the left test head (port 1) a little bit at a time, while turning the threaded ring on the left head test port connector by hand onto the cable attached to the right test head. Do *not* use the threaded ring on the test port connector to pull the cable into the connector. Repeat this process until the cable is firmly seated into port 1, then make the threaded ring barely finger tight. Finally use the torque wrench on the port 1 threaded ring and a backup wrench on the cable to tighten the connection.

4. Select **Select Standard** to go to the Standard Selection Menu.
5. To verify the system, use the Verification Standards provided with the 85059A 1.0 mm Precision Calibration and Verification Kit (refer to Table 4-6). Using the menu select the verification standard and enter the standard's serial number. The verification standards may be measured in any order.

Table 4-6 Verification standards from 1.0 mm calibration and verification kit

Type of Standard	Part Number
Mismatched Thru Adapter	85059-60016
Match Thru Adapter	85059-60017

NOTE

It is recommended to connect the Verification Standards to the cable on port 2 prior to attempting to connect to port 1. Then follow the recommended procedure for making a thru connection outlined under step 3 above to avoid damaging the cable.

6. Use defaults for **Cal Set for Broadband Measurement: 1** and **Cal Set for 45 MHz Measurement (If Required): 2** in the Standard Menu.
7. If your system has Option 005, verify that **Cal Set for 45 MHz Measurement (If Required)** is set to **Yes**. Otherwise, set to **No**.
8. Select **Done** and follow the program prompts.
9. Select **Measure Data** to measure the verification standards. Follow the program prompts.
10. When verification has been completed view the data, then print or save (if required). If needed the verification standard can be remeasured by selecting **Repeat Measure**.

11. Select **Select Standard** to return to the Standard Selection Menu. Repeat steps 5 through 10 above for the other verification standard (refer to Table 4-6 on page 4-9).
12. Select **Prior Menu** until the Main Menu appears.

High Band Verification (> 50 GHz)

NOTE

Before verification of the high band frequencies it is necessary to:
1) select new hardware for the system, and
2) perform a calibration (for the frequency band > 50 GHz).

1. From the Main Menu select **System Config** then **Hardware Config.**
2. Select the proper hardware setup for High Band Verification (> 50 GHz) using Table 4-2 on page 4-3 for the E7352A 110 GHz System *or* Table 4-3 on page 4-3 for the E7342A 85 GHz System.
3. Select **Done** and **Prior Menu** to return to Main Menu.
4. Select **Verify System** to go to the System Performance Verification Menu.
5. Select **System Cal** and follow the program prompts to calibrate the system for frequencies >50 GHz. See Table 4-1 on page 4-2 for the calibrations required and suggested calibration storage locations (refer to step 3 on page 4-8).
6. Select **Select Standard** to go to the Standard Selection Menu.
7. To verify the system use the Verification Standards provided with the 85059A 1.0 mm Precision Calibration and Verification Kit (refer to Table 4-6 on page 4-9). Using the menu select the verification standard and enter the standard's serial number. The verification standards may be measured in any order.

NOTE

It is recommended to connect the Verification Standards to the cable on port 2 prior to attempting to connect to port 1. Then follow the recommended procedure for making a thru connection outlined under step 3 on page 4-8 to avoid damaging the cable.

8. Change default for **Cal Set for Broadband Measurement** from **1** to **3.**

NOTE

It is suggested that the High Band Calibration be stored in Cal Set 3 (Refer to Table 4-1 on page 4-2).

9. Verify **Cal Set for 45 MHz Measurement (If Required)** is set to **No**.
10. Select **Done** and follow the program prompts.
11. Select **Measure Data** to measure the verification standards. Follow the program prompts.
12. When verification has been completed view the data, then print or save (if required). If needed the verification standard can be remeasured by selecting: **Repeat Measure**.
13. Select **Select Standard** to return to the Standard Selection Menu. Repeat steps 7 through 12 above for the other verification standard (refer to Table 4-6 on page 4-9).
14. Select **Prior Menu** until the Main Menu appears.
15. Select **Quit Program** to exit the program, then close the program window to finish.

CW Frequency Accuracy Test

NOTE

The CW frequency accuracy test should be performed prior to doing the conversion loss calibration adjustment or detector gain calibration.

Source frequency accuracy is tested across the entire sweep range for 8360 sources. The CW frequency accuracy is measured with a frequency counter.

Materials Required

The following materials are required to run the tests:

- 5343 Option 001, 10 MHz to 26.5 GHz frequency counter
- 10 dB pad

NOTE

If the source and test set operate below 500 MHz, connect the test set output to the 10 Hz to 500 MHz BNC connector on the frequency counter. The input switch on the frequency counter must also be in the 10 Hz to 500 MHz position.

Procedure

1. Connect the equipment as shown in Figure 4-1.

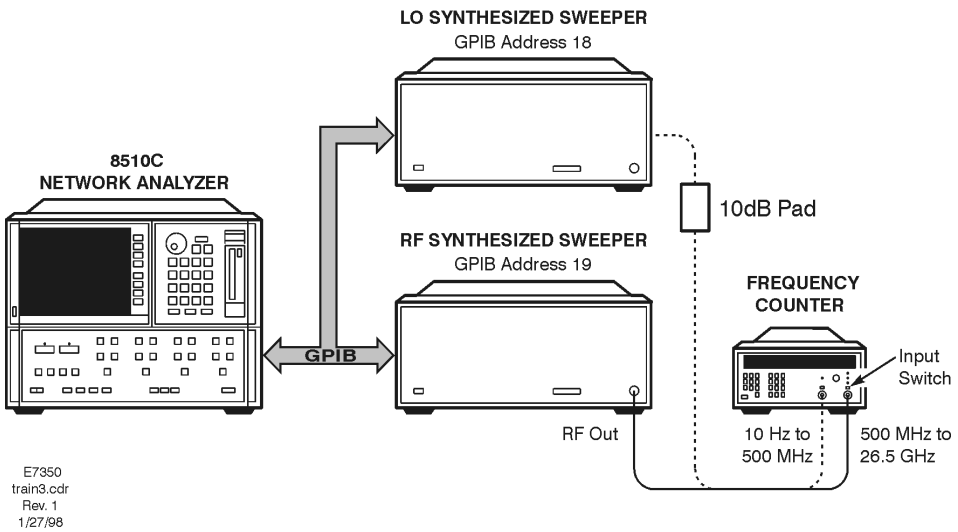


Figure 4-1 CW frequency accuracy equipment setup

2. To preset the instruments, press **INSTRUMENT STATE [RECALL]** ***{MORE}*** ***{FACTORY PRESET}***. Disregard any error messages.

3. To set the frequency using the analyzer front panel, press **STIMULUS [CENTER] [MENU]** ***{SINGLE POINT}***.

   Enter the start frequency of the source.

4. Measure RF and LO frequencies with the counter, and record these values on the test record at the end of this section.

5. From the analyzer front panel, enter the frequency per the tables at the end of this section.

NOTE

Be sure to connect RF and LO output to the 500 MHz to 26.5 GHz input on the frequency counter. Also set the input switch to the 500 MHz to 26.5 GHz position.

6. Measure the frequency with the counter, then record the value on the test record at the end of this section.

In Case of Difficulty

If the measured values do not meet the specifications listed on the test record, refer to your source manual for adjustment and troubleshooting instructions.

Performance Test Record

Record the measured frequencies for RF source readings on Table 4-7, and for LO source on Table 4-8.

Table 4-7 Performance test record for CW frequency accuracy test (RF source)

Instrument Model: _____ **Report Number:** _____ **Date:** _____

Frequency	Minimum Specification	Recorded Results	Maximum Specification	Uncertainty[1]
45 MHz	44.999955 MHz		45.000045 MHz	10 Hz
2 MHz	1.999998 GHz		2.000002 GHz	10 Hz
20 GHz[2]	19.99998 GHz		20.00002 GHz	4 kHz
26 GHz	26.4999735 GHz		26.5000256 GHz	5 kHz

1. The measurement uncertainty is quoted for these performance tests using only the recommended models specified in Table 8-1 of the “Equipment Required” chapter of the On-Site Service Manual. The quoted uncertainty represents limits of 3 times the equivalent standard deviation (3s) and is intended to represent 90% confidence level.

2. For 83620A/B or 83621A/B only.

Table 4-8 Performance test record for CW frequency accuracy test (LO source)

Instrument Model: _____ **Report Number:** _____ **Date:** _____

Frequency	Minimum Specification	Recorded Results	Maximum Specification	Uncertainty[1]
45 MHz	44.999955 MHz		45.000045 MHz	10 Hz
2 MHz	1.999998 GHz		2.000002 GHz	10 Hz
20 GHz[2]	19.99998 GHz		20.00002 GHz	4 kHz

1. The measurement uncertainty is quoted for these performance tests using only the recommended models specified in Table 8-1 of the “Equipment Required” chapter of the On-Site Service Manual. The quoted uncertainty represents limits of 3 times the equivalent standard deviation (3s) and is intended to represent 90% confidence level.

2. For 83620A/B or 83621A/B only.

Two-Band Calibration Procedure for 8510XF Performance Verification

The 8510XF requires separate verifications for frequencies below and above 50 GHz (see "Frequency Ranges" in this same chapter).

A special two-band calibration procedure is required for the performance verification of the 8510XF System (a single full-band measurement calibration is *not* equivalent).

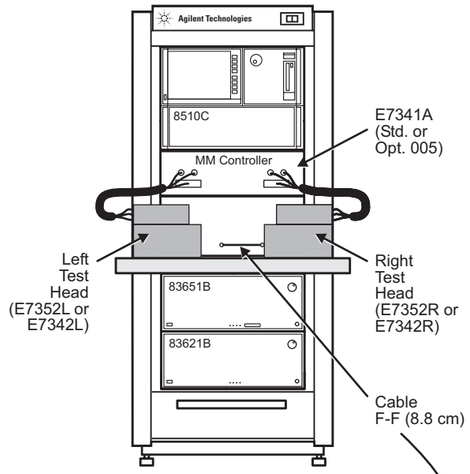
There are up to three different full 2-port calibrations and corresponding frequency ranges required, which are stored in suggested locations in the 8510 analyzer.

Calibration Storage Locations

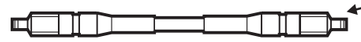
File Location Name:	Frequency Range of Data Stored:
Cal Set 1	1–50 GHz[1] (2–50 GHz)[2]
Cal Set 2	45 MHz[1]
Cal Set 3	50–110 GHz[3]

1. This calibration is for Option 005 systems only.
2. The frequency for standard systems is 2–50 GHz.
3. The frequency range shown is for the E7352A system only. The E7342A system's frequency range will be: 50–85 GHz

For more information refer to the section on "Frequency Ranges" in this same chapter. The parameters for these calibrations are set up automatically on the analyzer by the performance verification software.



Full 2-port calibration system configuration for performance verification in 1.0 mm coax.



Cable F-F (8.8 cm) 11500-60001
From 85059A calibration verification kit

Calibration Techniques and Standards

Calibration Kit Label: 1.00mmA.1A
Disk File Name: CK_MMKA1A

Frequency Range	Calibration Technique	"Open" Standard (Reflection)	"Short" Standard (Reflection)	"Load" Standard (Reflection)	"Thru" Standard (not used for 1-port cal)	"Isolation" Standard
DC–50 GHz[3]	SOLT[1]	Open	Short 3	50 GHz Load	Thru	50 GHz Load
50–110 GHz	Offset Shorts	Short 3	Short 1	Short 4 Short 2	Thru	Load BB[2]

1. SOLT = Short, Open, Load and Thru standards
2. The broadband load is a combination of a lossy delay line plus a 50 GHz load.
3. Also used for 45 MHz frequency point.

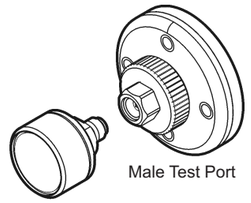
Calibration Techniques:

A variety of calibration techniques can be used with the 8510XF, including the following:

- **SOLT** (Short-Open-Load-Thru) Used for performance verification 45 MHz to 50 GHz.
- **Offset Shorts** (Shorts with different offset lengths) Used for performance verification 50 GHz to 110 GHz.
- **TRL** (Thru-Reflect-Line)**
- **TRM** (Thru-Reflect-Match)**

** Note: Not used for performance verification

The calibration technique used depends in part on the type of calibration kit used. The 1.0 mm calibration kit (85059A) was designed specifically for the 8510XF, and uses a combination of two calibration techniques: SOLT calibration for frequencies up to 50 GHz, and offset shorts calibration for frequencies above 50 GHz. This combination of techniques provides the best possible calibration results on the 8510XF.



Female Calibration Standard

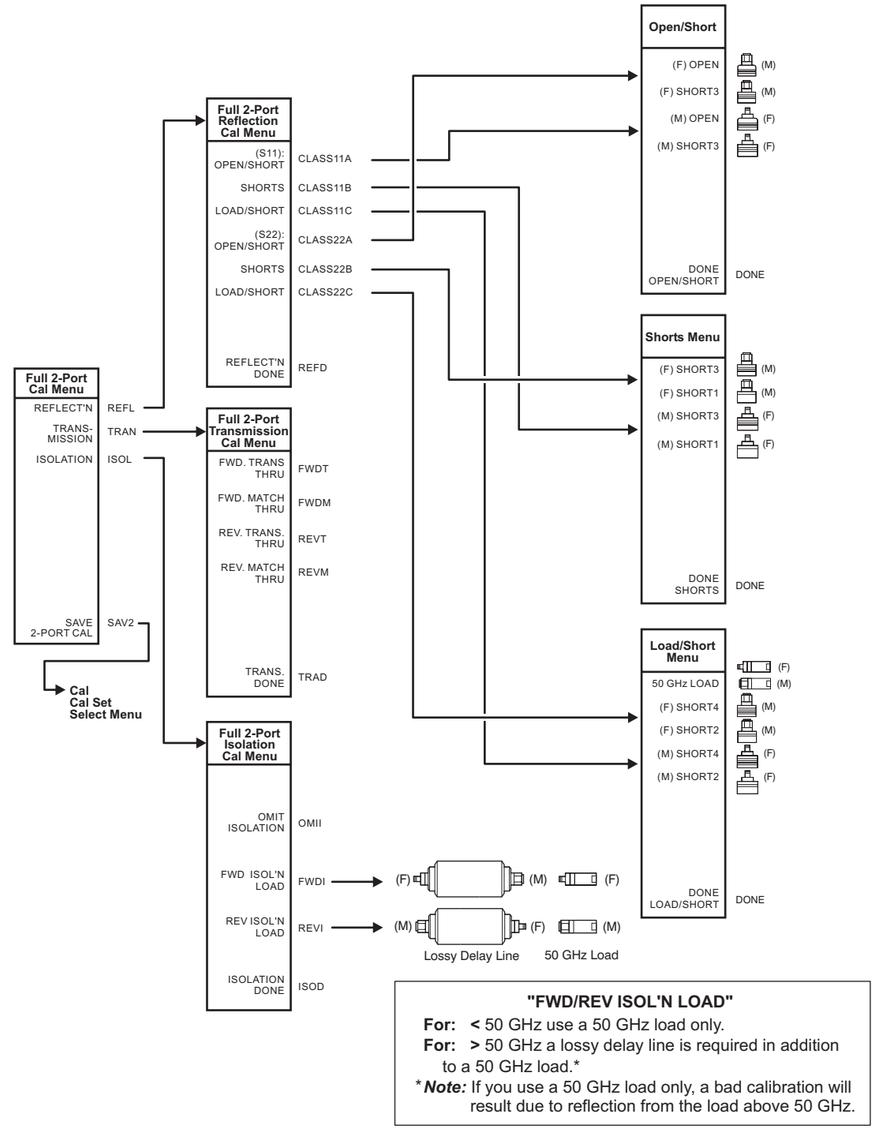
Male Test Port

Clarifying Connector Sex:

The calibration standard labels that appear in the 8510XF softkey calibration menus specify connector sex as "(M)" or "(F)". The sex designator refers to the sex of the test port connector to which the calibration standard is connected (*not* the sex of the calibration standard connector).

Offset Shorts:

Offset shorts are used in the place of opens and loads at frequencies above 50 GHz. The "OPEN" category is therefore renamed "OPEN/SHORT," and the "LOAD" category is renamed "LOAD/SHORT" on the calibration menu softkey labels.



"FWD/REV ISOL'N LOAD"

For: **<** 50 GHz use a 50 GHz load only.
For: **>** 50 GHz a lossy delay line is required in addition to a 50 GHz load.*
* ***Note:*** If you use a 50 GHz load only, a bad calibration will result due to reflection from the load above 50 GHz.

5 System Level Servicing & Troubleshooting

This chapter describes the basic servicing and troubleshooting techniques for the 8510XF system.

Theory of Operation

The 8510XF applies RF test signals to the DUT, and compares these incident signals to whatever is reflected from (or transmitted through) the DUT. The incident, reflected, and transmitted signals are separated out by means of directional couplers, and mixed down to create a set of four IF inputs to the analyzer, as illustrated below.

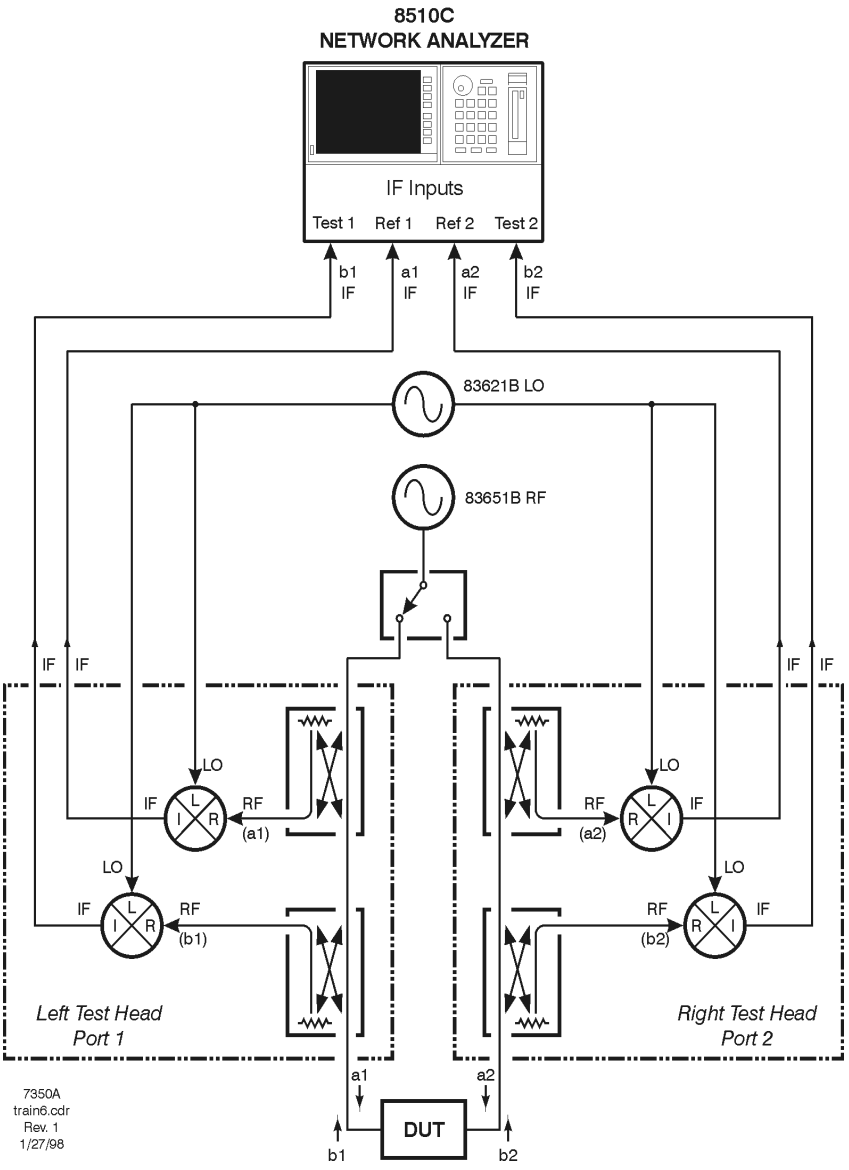


Figure 5-1 Basic operation of the system

At this simplified level of description, system operation does not differ from that of other 8510-based systems. What makes the 8510XF unique is the means by which it covers its extremely wide frequency range.

Figure 5-2 shows how the 8510XF test set is divided into frequency bands. For the sake of simplicity, this figure only shows half of the test set. An actual test set, with two base units and two test heads, would include twice as many mixers. Note that all bands make use of the same output/input paths, the same connection to the DUT, and the same directional couplers.

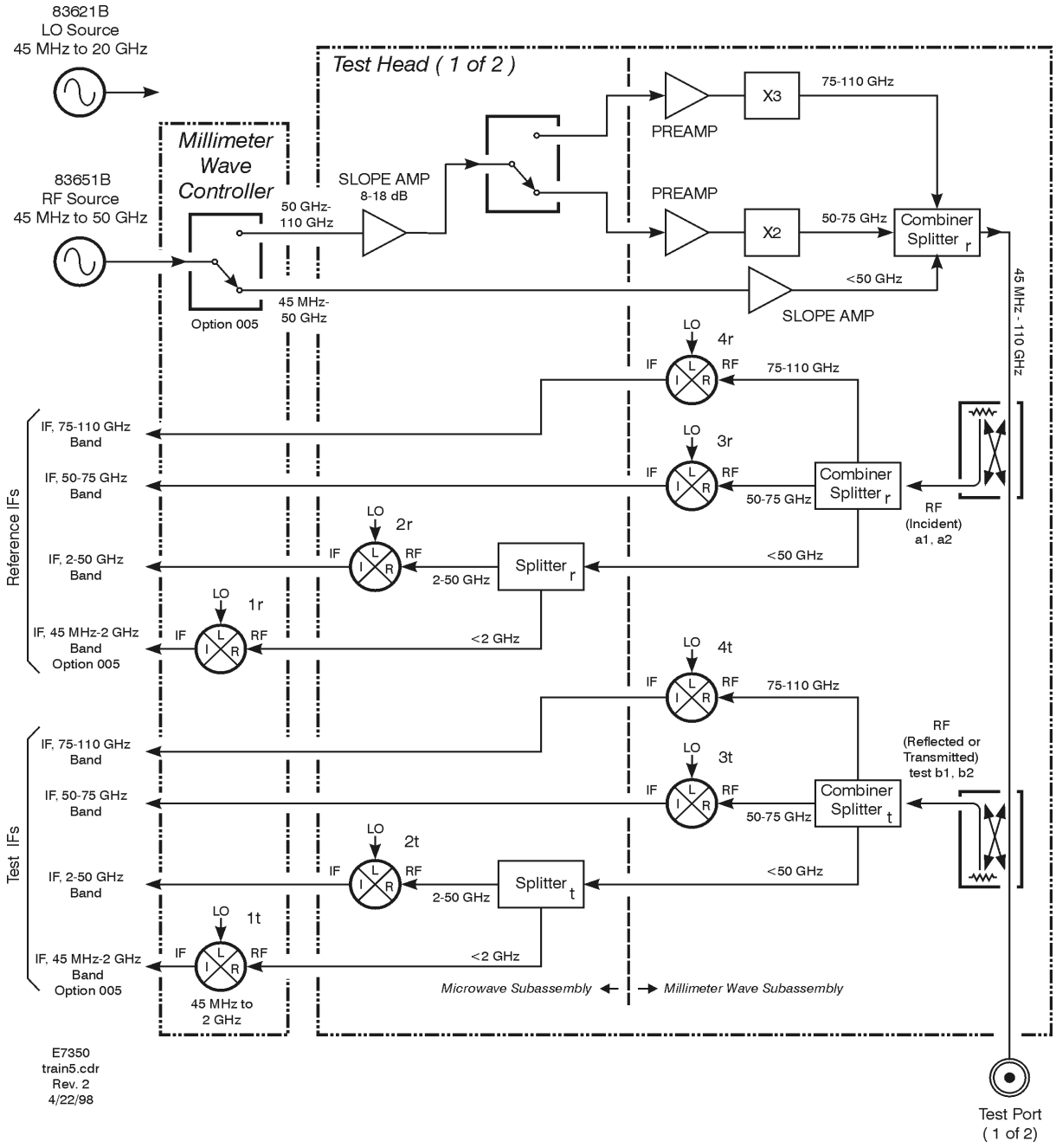


Figure 5-2 Modules of the 7352A test set

Millimeter Wave Controller

The controller has more functions than are illustrated in Figure 5-2 on page 5-3. It controls the switching of RF paths in the microwave subheads and test heads at different points in the system's frequency range. It also collects together the IFs generated by all mixers in the microwave subhead, the millimeter test heads, and the controller itself, and uses a multiplexer to furnish the appropriate IFs to the network analyzer at each moment in time.

Frequency Bands

Each frequency band uses its own set of mixers. The bands are as follows.

Band	Included In
.045 to 2 GHz	8510XF systems with Option 005
2 to 50 GHz	All 8510XF systems
50 to 85 GHz 50 to 75 GHz	E7340A systems/E7342A subsystems E7350A systems/E7352A subsystems
75 to 110 GHZ	E7350A systems/E7352A subsystems

Frequency Multiplication

The frequency range of the system greatly exceeds that of the system's RF source (the 83651B has a maximum frequency of 50 GHz). Frequencies above 50 GHz are generated through harmonic multiplication of the RF source. The signals from the LO source are also multiplied, in the sense that the mixers in certain ranges are designed to use a harmonic of the LO input, rather than the fundamental input. The details for each band are discussed below.

75 to 110 GHz Band

In the 75 to 110 GHz range, the signal from the RF source is applied to a frequency tripler in the test head. The mixers for this range are located in the test head, and designed to use the 18th harmonic of the LO input frequency. This applies to E7350A systems and E7352A subsystems only.

50 to 85 GHz or 50 to 75 GHz Band

In the 50 to 85 GHz range, the signal from the RF source is applied to a frequency doubler in the test head. The mixers for this range are located in the test head, and designed to use the 14th harmonic of the LO input frequency. For E7350A systems and E7352A subsystems, this band covers the 50 to 75 GHz range.

2 to 50 GHz Band

In the 2 to 50 GHz range, the signal from the RF is not multiplied; it is applied directly to the mixers. The mixers for this range are located in the microwave subhead. In a portion of this range (from 18 to 50 GHz) the mixers use the third harmonic of the LO input frequency. In the remainder of this range (from 2 to 18 GHz), the mixers use the fundamental of the LO input frequency.

0.045 to 2 GHz Band

In the .045 to 2 GHz range, the signal from the RF source is not multiplied; it is applied directly to the mixers. The mixers for this range are located in the millimeter wave controller, and are designed to use the fundamental of the LO input frequency. This applies to 8510XF systems equipped with Option 005 only.

8510XF Firmware Specifications

Operating Parameters

Frequency Limits: 45 MHz to 85 GHz (E7340A/E7342A with Option 005) or 45 MHz to 110 GHz (E7350A/E7352A with Option 005)

Band Crossings:

Table 5-1 Band crossings (45 MHz- 85 GHz)

RF Frequency	RF Harm	LO Harm	Band
45 MHz - 2 GHz	1	1	0
2 - 18 GHz	1	1	1
18 - 50 GHz	1	3	1
50 - 64.2 GHz	2	12	2
64.2 - 85 GHz	2	14	2

Table 5-2 Band crossings (45 MHz- 110 GHz)

RF Frequency	RF Harm	LO Harm	Band
45 MHz - 2 GHz	1	1	0
2 - 18 GHz	1	1	1
18 - 50 GHz	1	3	1
50 - 64.2 GHz	2	12	2
64.2 - 75 GHz	2	14	2
75 - 85.5 GHz	3	14	3
85.5 - 97.7 GHz	3	16	3
97.7 - 110 GHz	3	18	3

Step Mode

Internally implemented as frequency list mode.

- 51 points
- 101 points
- 201 points
- 401 points
- 801 points

List Mode

Up to 801 points.

Sweep Time Similar to 8510C.

Hardware States

The hardware states specific to the 8510XF are as shown in Table 5-3.

Table 5-3 Hardware States Specific to 8510XF

System Parameter	Frequency Range (45 MHz to 50 GHz)	Frequency Range (50 to 85 GHz, or 50 to 110 GHz)
System Phaselock[1]	None	None
Multi Source[1]	On	On
Leveling Source #1 (RF)[2]	System (External)	System (External)
Leveling Source #2[2]	System (Internal)	System (Internal)

1. These menus are integrated into the firmware and are not available as softkeys.
2. Source leveling is set to system for normal (default) 8510XF operation. The source will indicate external leveling for the RF source and internal leveling for the LO source.

Receiver: Constant frequency = 0.020000000 GHz

Instrument States

Table 5-4 shows the instrument states specific to the 8510XF system.

Table 5-4 Instrument states specific to the 8510XF system

System Parameter	Frequency Range (45 MHz to 50 GHz)	Frequency Range (50 to 85 GHz or 50 to 110 GHz)
RF Power source #1[1,2]	–10 dBm	–10 dBm
LO Power source #2[1,2]	+10 dBm	+10 dBm
Z_0	50 ohm	50 ohm[3]
Delay	Coaxial	Coaxial

1. The 8510XF normally operates in step mode (ramp mode is not available).
2. Source power is set/read with internal source leveling selected. Normal (default) operation of the 8510XF is with system source leveling selected.
3. Z_0 is normally set to one Ohm for calibrations/measurements using waveguide test port connectors.

Power Level Check

A quick operational check may be performed by measuring the power levels of the 8510XF user parameters a_1, b_1, a_2, and b_2. Observing the appropriate levels listed in Table 5-5 on page 5-9 gives the user a high level of confidence that the system is operating properly. For complete system verification, see **Performance Verification**, page 4-1.

1. If needed, save the current instrument state by pressing **INSTRUMENT STATE [SAVE]** and selecting 1-8. Press **INSTRUMENT STATE [RECALL], {MORE}, {FACTORY PRESET}** to restore the default factory instrument state. Change the instrument settings as indicated under "Power level check (low RF power)" on page 5-10.

2. Connect a short to test port 1. Press **PARAMETER [MENU]**, then ***{USER 1 a1}***. The forward reference signal path power level is displayed. The power level should be approximately as indicated in Table 5-5 and Figure 5-3 on page 5-11.

3. Select ***{USER 4 b1}***. The forward reflection signal path power level is displayed. The power level should be approximately as indicated in Table 5-5 and Figure 5-6 on page 5-12.

4. Connect a short to test port 1. In order to measure the reverse reference signal path, the parameter must be redefined. Press:

   {USER 3 a2}

   {REDEFINE PARAMETERS}

   {DRIVE} {DRIVE:PORT2}

   {REDEFINE DONE}

   The reverse reference signal path signal level is displayed. The power level should be approximately as indicated in Table 5-5 and Figure 5-5 on page 5-12.

5. In order to measure the reverse reflection signal path, the parameter must be redefined. Press:

   {USER 2 b2}

   {REDEFINE PARAMETERS}

   {DRIVE} {DRIVE:PORT2}

   {REDEFINE DONE}

   The reverse reflection signal path power level is displayed. The power level should be approximately as indicated in Table 5-5 and Figure 5-4 on page 5-11.

6. Connect Port 1 and Port 2 together. Select ***{USER 2 b2} {REDEFINE PARAMETERS} {DRIVE} {DRIVE:PORT1}***. The forward transmission signal path power level is displayed. The power level should be approximately 2 dB less than what was measured with a short on each test port.

NOTE The following measurements show the approximate RF signal levels incident at the first frequency conversion stage and are given in dBm even though the marker value is read out in dB.

NOTE Figures 5-3 through 5-6 are typical graphs from which the data in Table 5-5 was derived. These graphs are typical 8510XF user channel traces with offset shorts connected to Port 1 and Port 2. The RF source power level must be set so that it does not activate the IF OVERLOAD running error message.

Table 5-5 Typical power levels for power level check (low RF power) of the mm-wave sub-system

	Raw Channel Power		
	Frequency Range (GHz) 0.045 to 50	**Frequency Range (GHz) 50 to 85 (E7340A/E7342A) 50 to 75 (E7350A/E7352A)**	**Frequency Range (GHz) 75-110 (E7350A/E7352A only)**
a_1 (USER 1)	–5 to –35	–30 to –50	–35 to –50
b_1 (USER 4)	–5 to –35	–30 to –50	–35 to –50
a_2 (USER 3)	–5 to –35	–30 to –50	–35 to –50
b_2 (USER 2)	–5 to –35	–30 to –50	–35 to –50

NOTE 0.1 dB compression, –8 dBm; typical, –10 dBm maximum; damage, +15 dBm.

If any of the power levels shown in Table 5-5 and Figures 5-3 through 5-6 are not observed (within approximately ±5 dB), consult the “Service and Troubleshooting” paragraphs in this Quick Reference Guide. An Agilent Customer Engineer may be contacted for service assistance (see “Contacting Agilent” on page v).

Additional graphs—for help with troubleshooting—are provided in the following sections:

- “Power level check (high RF power)” on page 5-13
- “Operator’s check (normal operating condition)” on page 5-16

Test Plots

Power level check (low RF power)

The RF source power level must be set so that the IF OVERLOAD running error message is not activated when obtaining these graphs. The graphs Figures 5-3 through 5-6 were obtained with the following settings:

1. Factory preset
2. Shorts connected to Ports 1 and 2
3. RF Source leveling: internal (no conversion loss calibration)
4. Disconnect the BNC cable from the millimeter-wave controller ALC output to the RF Source ALC input.
5. LO Source leveling: system (default)
6. RF Source power: –10 dBm (default)

NOTE

In order for no IF OVERLOAD running error message to occur, it may be necessary to set the RF Source power level lower.

7. LO Source power: +10 dBm (default)
8. Response reference value: 0 dB (default)
9. Response reference position: 8 Div

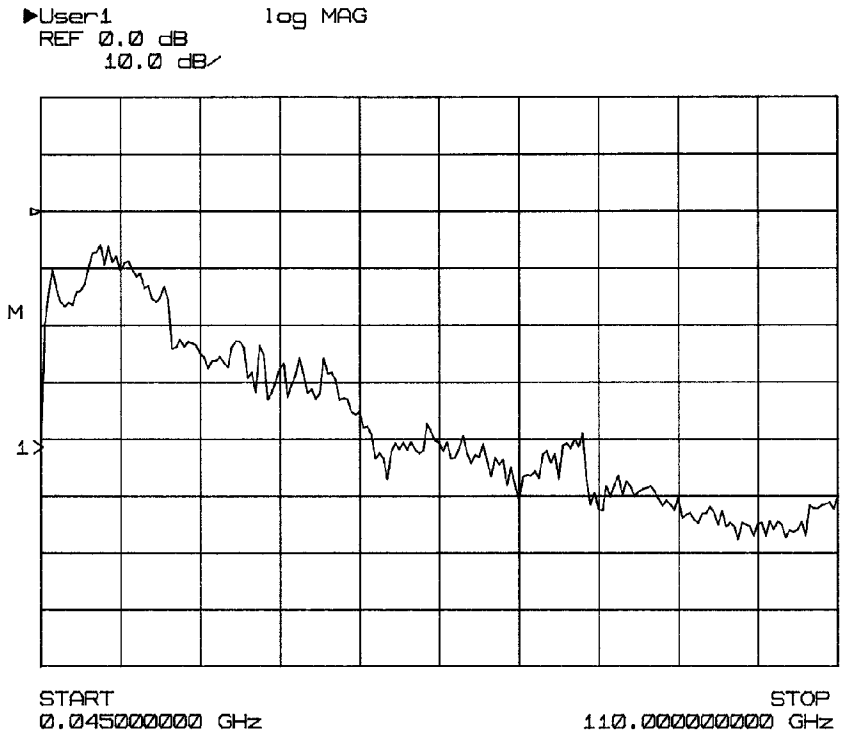


Figure 5-3 User 1 (a1)

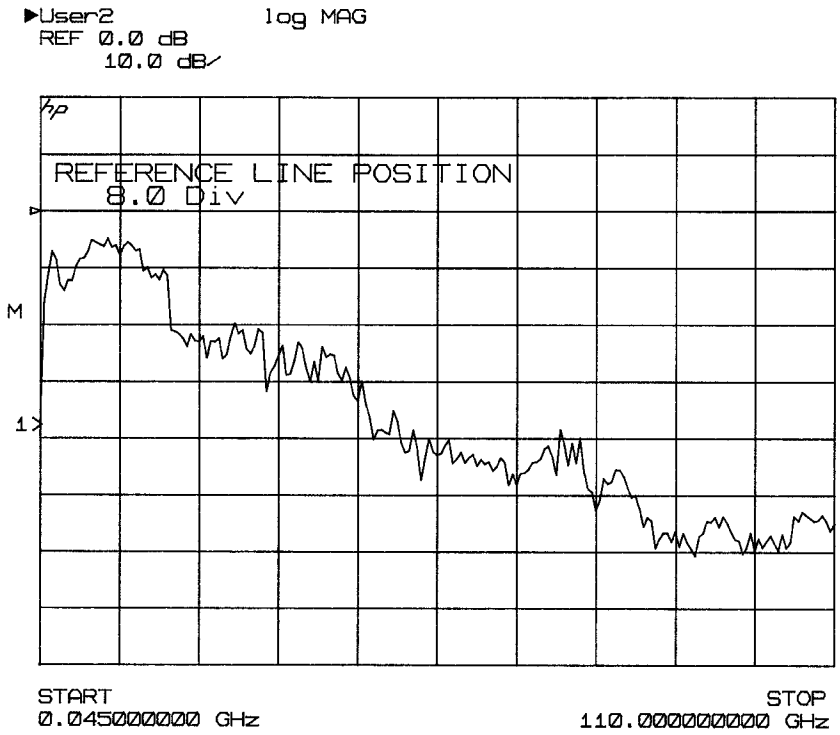


Figure 5-4 User 2 (b2)

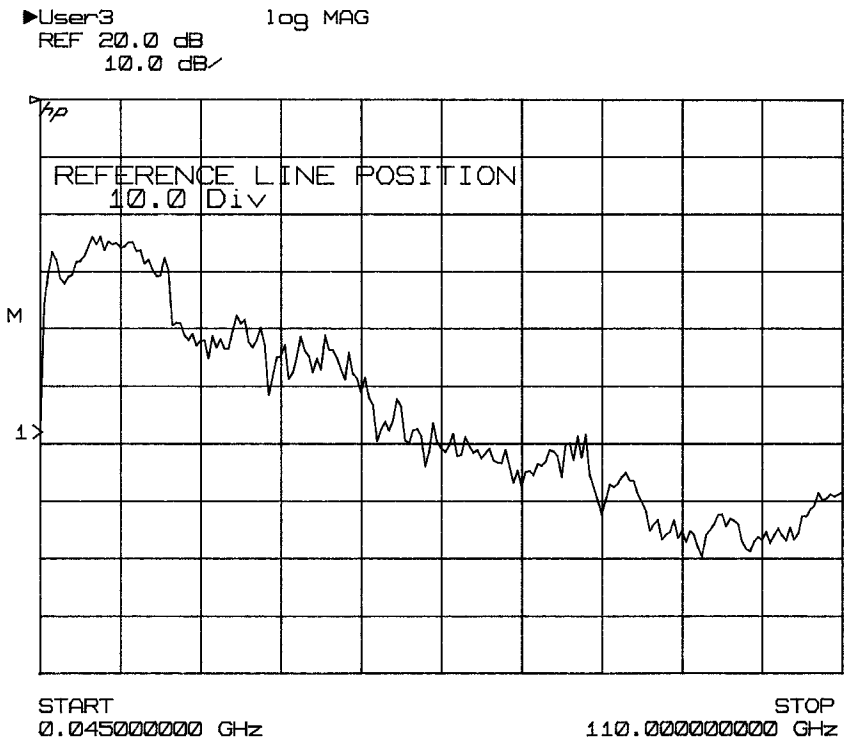


Figure 5-5 User 3 (a2)

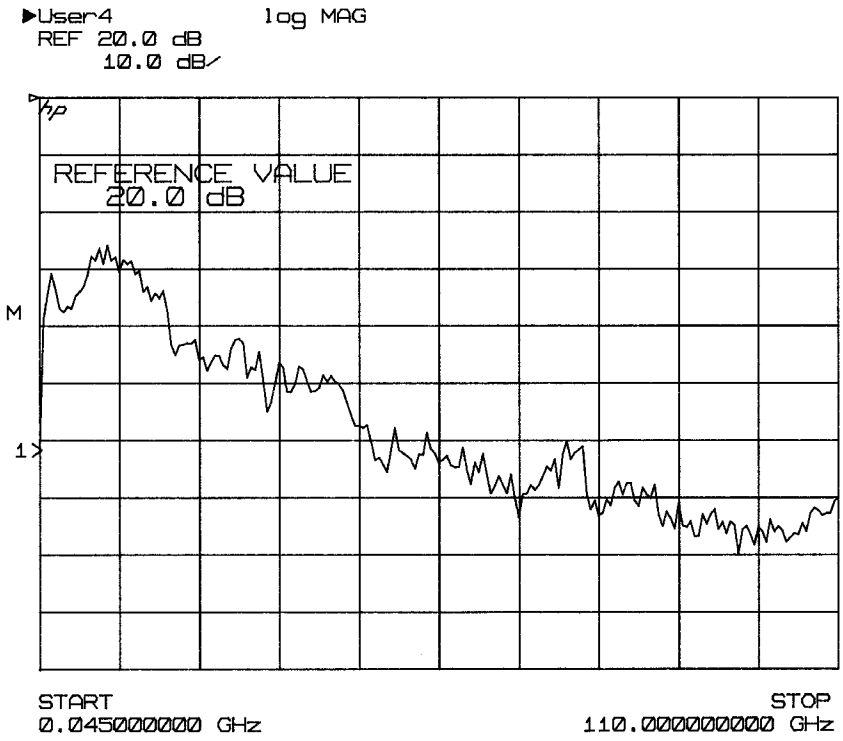


Figure 5-6 User 4 (b1)

Power level check (high RF power)

The IF OVERLOAD running error message is normal when obtaining these graphs. A power level of +10 dBm will over drive the 8510XF so you can see the intermodulation leveling differences. The graphs Figures 5-7 through 5-10 were obtained with the following settings:

1. Factory preset
2. Shorts connected to Ports 1 and 2
3. RF Source leveling: internal (no conversion loss calibration)
4. Disconnect the BNC cable from the millimeter-wave controller ALC output to the RF Source ALC input.
5. LO Source leveling: system (default)
6. RF Source power: +10 dBm

NOTE Disregard IF OVERLOAD running error message.

7. LO Source power: +10 dBm (default)
8. Response reference value: 0 dB (default)
9. Response reference position: 8 Div

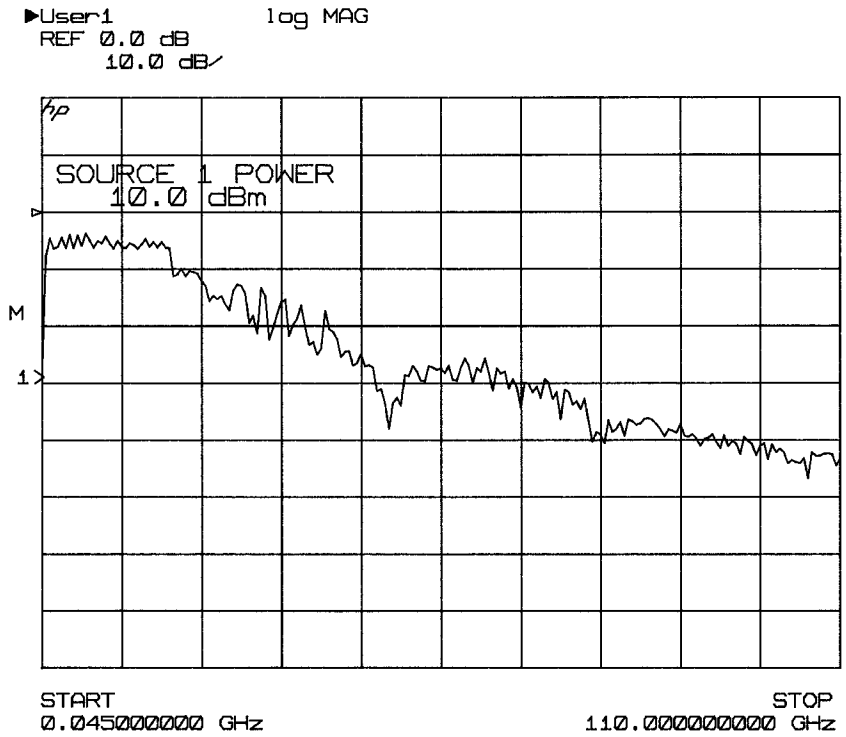


Figure 5-7 User 1 (a1)

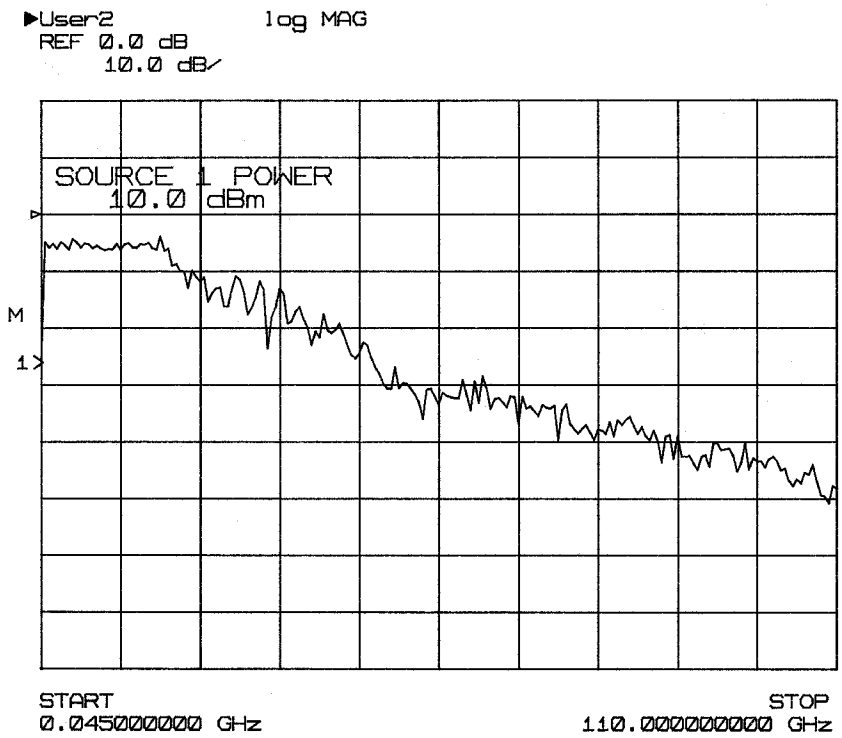


Figure 5-8 User 2 (b2)

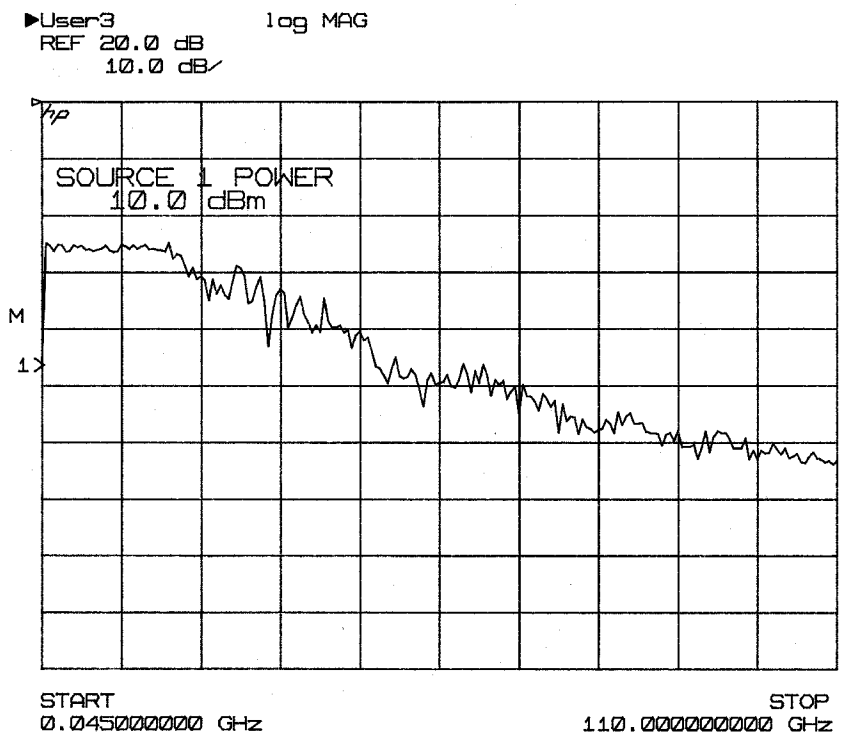


Figure 5-9 User 3 (a2)

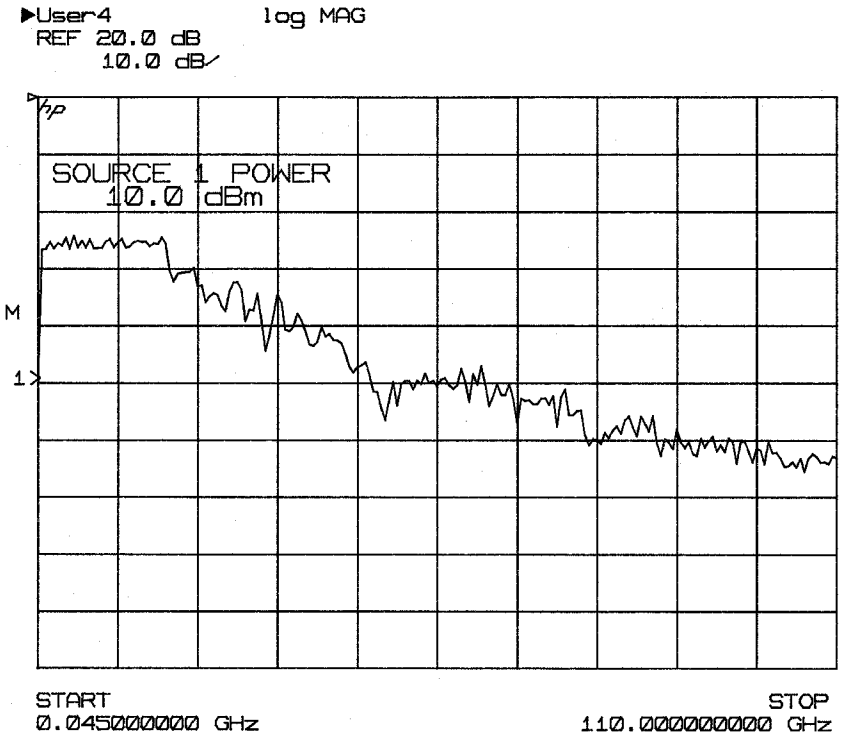


Figure 5-10 User 4 (b1)

Operator's check (normal operating condition)

The graphs Figures 5-11 through 5-14 were obtained with the following settings (normal default settings) after performing a factory preset:

1. Shorts connected to Ports 1 and 2
2. RF Source leveling: system (default—with conversion loss calibration)
3. BNC cable connected from millimeter-wave controller ALC output to the RF source ALC input (default).
4. LO Source leveling: system (default)
5. Port 1 and Port 2 power level: –15 dBm (default)
6. Response reference value: –20 dB
7. Response reference position: 5 Div (default)

NOTE

For additional information on normal operating conditions, refer to the "System Operation Test" section in the "Installation" chapter of the 8510XF Operating and Service Manual.

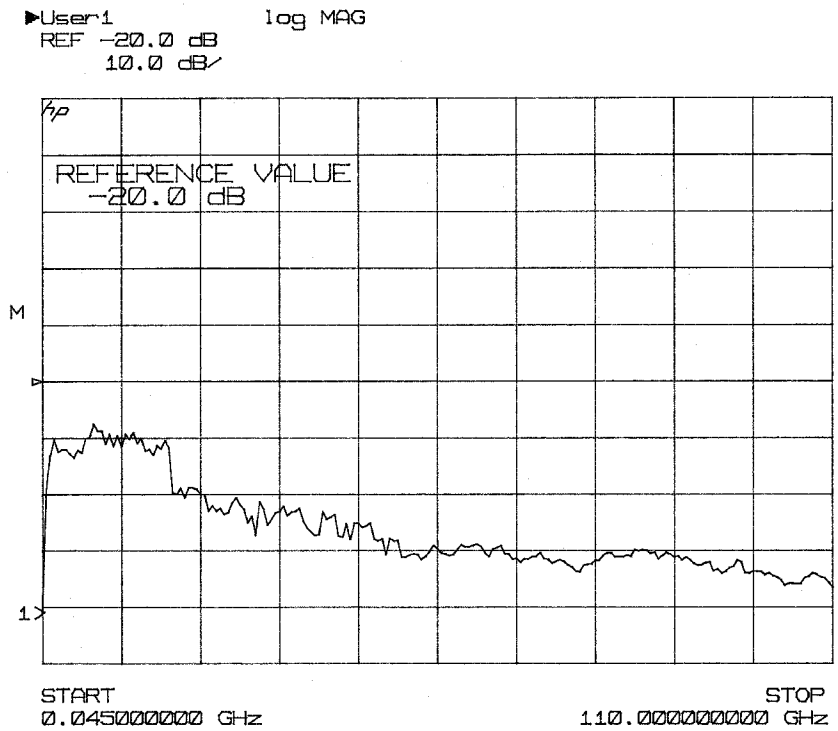


Figure 5-11 User 1 (a1)

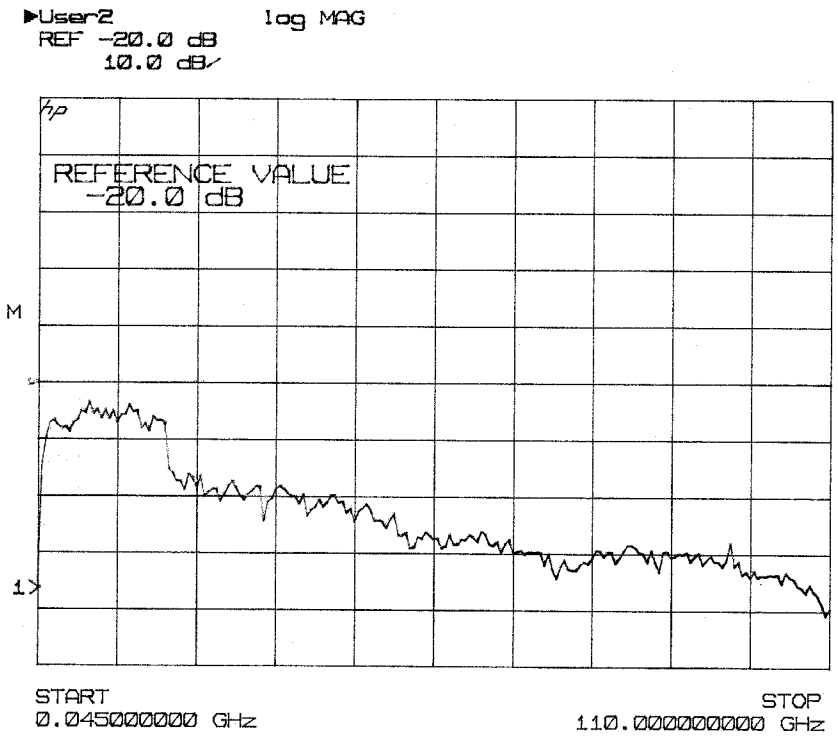


Figure 5-12 User 2 (b2)

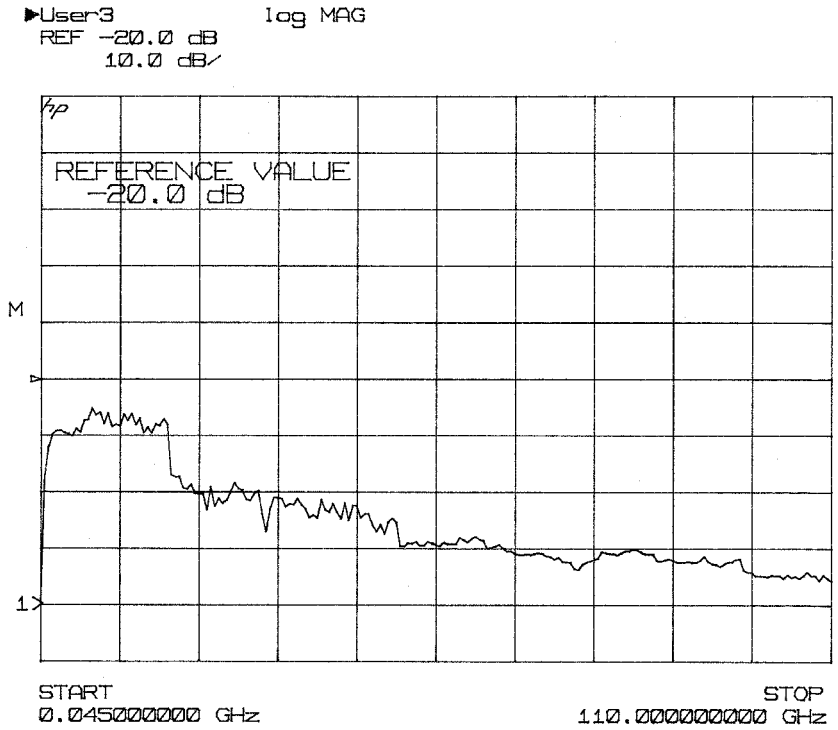


Figure 5-13 User 3 (a2)

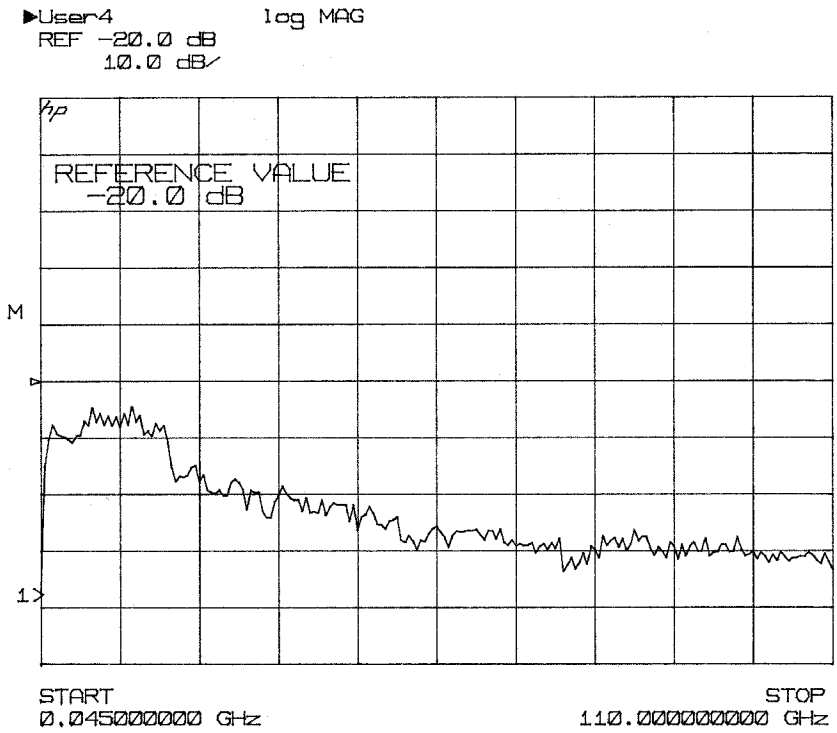


Figure 5-14 User 4 (b1)

AUXILLARY MENUS

SYSTEM

SYSTEM MENU

DISPLAY FUNCTIONS

HP-IB ADDRESSES

CRT OFF

FREQUENCY OFF

BEEPER ON | OFF

RESET IF CORRECTION

MORE

SYSTEM MORE MENU

PULSE CONFIG

EDIT MULT. SRC.

DATE/TIME FUNCTIONS

SYSTEM PHASELOCK

POWER LEVELING

ANALOG OUT ON | OFF

SERVICE FUNCTIONS

SERVICE FUNCTIONS MENU

TEST MENU

SYSTEM BUS 'LOCAL' | 'REMOTE'

IF GAIN

PEEK/POKE LOCATION | PEEK | POKE

SOFTWARE REVISION

MAIN SERVICE FUNCTIONS MENU

LOOPING SELF TESTS	SYSTEM COMMANDS
1 A5 PROCESSOR EPROM	15 RUN MAIN PROGRAM
2 A5 PROCESSOR RAM	16 MEMORY OPERATIONS
3 A7 DATA BUS	17 RERUN SELF TEST
4 A4 DISPLAY PROCESSOR	18 REPEAT TEST LOOP
5 A4 DISPLAY RAM	
6 A7 TIMER/CLOCK/RS-232	DISC COMMANDS
7 A7 PUBLIC HP-IB	
8 A7 SYSTEM BUS	19 LOAD PROGRAM DISC
9 INTERRUPT SYSTEM	20 RECORD PROGRAM DISC
10 A5 MULTIPLIER	21 INITIALIZE DISC
11 A7 DISC CONTROLLER	
12 A6 NON-VOLATILE MEMORY	SERVICE COMMANDS
13 IF DETECTOR DATA	
14 KEYBOARD	22 RUN SERVICE PROGRAM
	23 DIAGNOSE A FAILURE

ENTER SELECTION, THEN PRESS =MARKER

HP8510 SERVICE PROGRAM MENU

HP85101 DISPLAY/PROCESSOR SERVICE PROGRAM	1
HP85102 IF/DETECTOR SERVICE PROGRAM	2 (See next page)
TEST SET HP-IB SERVICE PROGRAM	3 (See next page)
HP8360 SERVICE PROGRAM	4 (See next page)
RETURN TO MAIN SERVICE FUNCTIONS MENU	F (see note 1)

NOTES: (1) Hex digits A thru F are assigned to [G/n], [M/u], [k/m], [X1], [+/-], and [.] respectively.

(2) To make a selection, type the number indicated, then press =MARKER.

(3) The default value on data entry is zero.

Copyright © Hewlett Packard 1987, 1988, 1991

HP85101 DISPLAY/PROCESSOR SERVICE PROGRAM MENU

CPU BOARD TESTS (A5)	1
I/O BOARD AND FRONT PANEL TESTS (A1, A2, A7)	2
DISPLAY BOARD AND CRT TESTS (A4, A11)	3
NON-VOLATILE MEMORY BOARD TESTS (A6)	4
RETURN TO HP8510 SERVICE PROGRAM MENU	F [.]

HP85101 CPU BOARD TESTS (A5)

DRAM REFRESH TEST	1
READ/WRITE/SHIFT ACCUMULATOR TEST	2
MULTIPLIER TEST	3
COMPLEX MULTIPLY TEST	4
CIRCLE TEST (EXERCISES MULTIPLIER)	5
*SIGNATURE ANALYSIS - MULTIPLIER	6
*SIGNATURE ANALYSIS - ADDRESS BUS	7
*SIGNATURE ANALYSIS - DATA BUS	8
RETURN TO HP85101 SERVICE PROGRAM MENU	F [.]

* - For factory use only.

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

HP85101 I/O BOARD AND FRONT PANEL TESTS (A1, A2, A7)

DISC CONTROLLER BUS TEST (A7)	1
DISC WRITE/READ TEST (A2, A7)	2
TIMER TEST (A7)	3
SERIAL I/O TEST (A7)	4
TIMER CLOCK PERIPHERAL (TCP) TESTS (A7)	5
CPU TO HP-IB TEST (A7)	6
BIDIRECTIONAL HP-IB TEST (A7)	7
STATIC INTERRUPT SYSTEM TEST (A7)	8
RPG TEST (A1, A7)	9
KEYBOARD AND LEDS TEST (A1, A7)	A [G/n]
HP85102 INTERFACE TEST (A7)	B [M/u]
*DYNAMIC INTERRUPT SYSTEM TEST (A7)	C [k/m]
*SECURITY KEYS INTERFACE TEST (A7)	D [X1]
WATCHDOG TIMER TEST (A7)	E [+/-]
RETURN TO HP85101 SERVICE PROGRAM MENU	F [.]

* - For factory use only.

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

HP85101 DISPLAY BOARD AND CRT TESTS (A4, A11)

GSP ADDRESS DECODER STIMULUS CRT LOOP	1
GSP DATA LINE STIMULUS LOOP	2
RAMP BACKGROUND DAC LOOP	3
RAMP INTENSITY DAC LOOP	4
CALIBRATE BACKGROUND AND INTENSITY	5
RECALL BACKGROUND AND INTENSITY CALIBRATION	6
SCREEN TEST PATTERNS	7
SOFTKEY LABEL ALIGNMENT PATTERN	8
RETURN TO HP85101 SERVICE PROGRAM MENU	F [.]

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

PASSWORD ENTRY *

CAUTION: The following tests will erase non-volatile memory. To access these tests, enter the password, then press =MARKER. To exit, just press =MARKER.

(Refer to the Service Manual for the password)

*NOTE:

Password is: '8515'
Be sure to have a backup of the operating system.

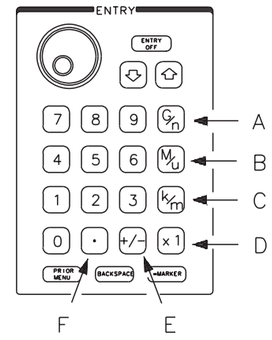
HP85101 NON-VOLATILE MEMORY BOARD (A6) TESTS

INITIALIZE MEMORY BOARD	1
COMPLETE MEMORY BOARD UNFORMATTED WRITE/READ TEST	2
COMPLETE MEMORY BOARD FORMATTED WRITE/READ TEST	3
READ/VERIFY TEST 3 DATA AGAIN	4
WRITE UNFORMATTED DATA TO SELECTED MEMORY LOCATIONS	5
READ/VERIFY TEST 5 DATA AGAIN	6
READ LOCATIONS WHERE HARDWARE CAL DATA IS STORED	7
SHOW NON-VOLATILE MEMORY PARAMETERS	8
*RESET MEMORY TO DEFAULT HARDWARE CAL DATA	9
RETURN TO HP85101 SERVICE PROGRAM MENU	F [.]

* - For factory use only.

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

ENTRY AREA HEX KEYS



rr59c

8510C SERVICE PROGRAM MENU (CRT) (1 OF 2)

HP8510 SERVICE PROGRAM MENU

HP85101 DISPLAY/PROCESSOR SERVICE PROGRAM	1 (See prev. page)
HP85102 IF/DETECTOR SERVICE PROGRAM	2
TEST SET HP-IB SERVICE PROGRAM	3
HP8360 SERVICE PROGRAM	4
RETURN TO MAIN SERVICE FUNCTIONS MENU	F (see note 1)

NOTES: (1) Hex digits A thru F are assigned to [G/n], [M/u], [k/m], [X1], [+/-], and [.] respectively.

(2) To make a selection, type the number indicated, then press =MARKER.

(3) The default value on data entry is zero.

Copyright © Hewlett Packard 1987, 1988, 1991

TEST SET HP-IB SERVICE PROGRAM MENU

PRESET TEST SET	1
SWITCH ACTIVE LIGHT	2
*SWITCH PORT 1,2 LIGHTS	3
*ACTIVATE PORT 1,2 ATTENUATOR	4
*INCREMENT ACTIVE ATTENUATOR	5
SELECT NEW HP-IB ADDRESS	6
RETURN TO HP8510 SERVICE PROGRAM MENU	F [.]

* - For test sets with appropriate feature.

NOTES: (1) To repeat a function, press =MARKER.
(2) The default Test Set HP-IB address is 20.

HP8360 SERVICE PROGRAM MENU

HP-IB TEST	1
FRONT PANEL EMULATOR	2
CHANGE HP-IB ADDRESS (default is 19)	3
RETURN TO HP8510 SERVICE PROGRAM MENU	F

On the HP85102 rear panel, connect '20 MHz OUT' to 'J1 TEST SET INTERCONNECT' using the service adapter and a BNC cable. Also, connect 'ANALOG + - 10V' to 'SWEEP IN 0-10V' using another BNC cable. Failure to do so will result in false error messages.**

PRESS =MARKER TO CONTINUE . . .

** NOTE:
Disconnect BNC cables from 85102 to source when running tests. Failure to do so will result in false error messages.

HP85102 IF/DETECTOR SERVICE PROGRAM MENU

ADC CONTROL TEST (A19)	1
SWEEP ADC TEST (A20)	2
ADC TEST (A18)	3
CAL DAC TEST (A17)	4
100 kHz IF AMPLIFIER TEST (A10, A12)	5
SYNCHRONOUS DETECTOR TEST (A5, A7)	6
20 MHz MIXER TEST (A9, A11, A13, A14)	7
PRETUNE PHASE LOCK TEST (A22)	8
MAIN PHASE LOCK TEST (A23)	9
IF COUNTER TEST (A21)	A [G/n]
RUN ALL THE ABOVE TESTS ***	B [M/u]
HP85102 FRONT PANEL TEST	C [k/m]
RETURN TO HP8510 SERVICE PROGRAM MENU	F [.]

NOTE: Always check cables leading to and from boards with suspected problems.

*** NOTE:
May fail tests 1 or 2 due to processor speed issue when running all tests. If tests 1 and 2 pass individually then assume the instrument is OK.

AUXILLARY MENUS

SYSTEM

SYSTEM MENU

DISPLAY FUNCTIONS

HP-IB ADDRESSES

HP-IB CONFIGURE

BEEPER ON / OFF

RESET IF CORRECTION

MORE

SYSTEM MORE MENU

PULSE CONFIG

EDIT MULT. SRC.

SYSTEM PHASELOCK

POWER LEVELING

ANALOG OUT ON / OFF

SERVICE FUNCTIONS

SERVICE FUNCTIONS MENU

TEST MENU

SYSTEM BUS 'LOCAL' / 'REMOTE'

IF GAIN

PEEK/POKE LOCATION

PEEK

POKE

SOFTWARE REVISION

MAIN SERVICE FUNCTIONS MENU

LOOPING SELF TESTS

1 A5 PROCESSOR EPROM
2 A5 PROCESSOR RAM
3 A7 DATA BUS
4 A14 DISPLAY PROCESSOR
5 A14 DISPLAY RAM
6 A7 TIMER/CLOCK/RS-232
7 A7 PUBLIC GPIB
8 A7 SYSTEM BUS
9 INTERRUPT SYSTEM
10 A5 MULTIPLIER
11 A7 DISC CONTROLLER
12 A6 NON-VOLATILE MEMORY
13 IF DETECTOR DATA
14 KEYBOARD

SYSTEM COMMANDS

15 RUN MAIN PROGRAM
16 MEMORY OPERATIONS
17 RERUN SELF TEST
18 REPEAT TEST LOOP

DISC COMMANDS

19 LOAD PROGRAM DISC
20 RECORD PROGRAM DISC
21 INITIALIZE DISC

SERVICE COMMANDS

22 RUN SERVICE PROGRAM
23 DIAGNOSE A FAILURE

ENTER SELECTION, THEN PRESS =MARKER

8510 SERVICE PROGRAM MENU

85101 DISPLAY/PROCESSOR SERVICE PROGRAM	1
85102 IF/DETECTOR SERVICE PROGRAM	2 (See next page)
TEST SET GPIB SERVICE PROGRAM	3 (See next page)
8360 SERVICE PROGRAM	4 (See next page)
RETURN TO MAIN SERVICE FUNCTIONS MENU	F (see note 1)

NOTES: (1) Hex digits A thru F are assigned to [G/n], [M/u], [k/m], [X1], [+/-], and [.] respectively.

(2) To make a selection, type the number indicated, then press =MARKER.

(3) The default value on data entry is zero.

Copyright © Agilent Technologies 1987, 2001

85101 DISPLAY/PROCESSOR SERVICE PROGRAM MENU

CPU BOARD TESTS (A5)	1
I/O BOARD AND FRONT PANEL TESTS (A1, A2, A7)	2
DISPLAY BOARD AND LCD TESTS (A14, A15)	3
NON-VOLATILE MEMORY BOARD TESTS (A6)	4
RETURN TO 8510 SERVICE PROGRAM MENU	F [.]

85101
CPU BOARD TESTS (A5)

DRAM REFRESH TEST	1
READ/WRITE/SHIFT ACCUMULATOR TEST	2
MULTIPLIER TEST	3
COMPLEX MULTIPLY TEST	4
CIRCLE TEST (EXERCISES MULTIPLIER)	5
*SIGNATURE ANALYSIS - MULTIPLIER	6
*SIGNATURE ANALYSIS - ADDRESS BUS	7
*SIGNATURE ANALYSIS - DATA BUS	8
RETURN TO 85101 SERVICE PROGRAM MENU	F [.]

* - For factory use only.

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

85101
I/O BOARD AND FRONT PANEL TESTS (A1, A2, A7)

DISC CONTROLLER BUS TEST (A7)	1
DISC WRITE/READ TEST (A2, A7)	2
TIMER TEST (A7)	3
SERIAL I/O TEST (A7)	4
TIMER CLOCK PERIPHERAL (TCP) TESTS (A7)	5
CPU TO GPIB TEST (A7)	6
BIDIRECTIONAL GPIB TEST (A7)	7
STATIC INTERRUPT SYSTEM TEST (A7)	8
RPG TEST (A1, A7)	9
KEYBOARD AND LEDS TEST (A1, A7)	A [G/n]
85102 INTERFACE TEST (A7)	B [M/u]
*DYNAMIC INTERRUPT SYSTEM TEST (A7)	C [k/m]
*SECURITY KEYS INTERFACE TEST (A7)	D [X1]
WATCHDOG TIMER TEST (A7)	E [+/-]
RETURN TO 85101 SERVICE PROGRAM MENU	F [.]

* - For factory use only.

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

85101
DISPLAY BOARD AND LCD TESTS (A14, A15)

GSP ADDRESS DECODER STIMULUS LOOP	1
GSP DATA LINE STIMULUS LOOP	2
RAMP BACKLIGHT DAC LOOP	3
RAMP UNUSED DAC LOOP	4
SAVE TIME, DATE, AND LCD BACKLIGHT SETTINGS	5
RECALL TIME, DATE AND LCD BACKLIGHT SETTINGS	6
SCREEN TEST PATTERNS	7
SOFTKEY LABEL ALIGNMENT PATTERN (NOT USED)	8
RETURN TO 85101 SERVICE PROGRAM MENU	F [.]

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

PASSWORD ENTRY *

CAUTION: The following tests will erase non-volatile memory. To access these tests, enter the password, then press =MARKER. To exit, just press =MARKER.

(Refer to the Service Manual for the password)

*NOTE:

Password is: '8515'
Be sure to have a backup of the operating system.

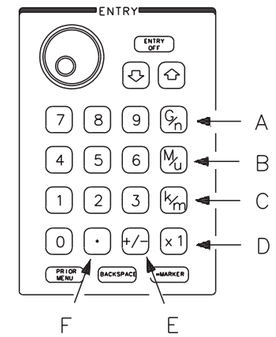
85101
NON-VOLATILE MEMORY BOARD (A6) TESTS

INITIALIZE MEMORY BOARD	1
COMPLETE MEMORY BOARD UNFORMATTED WRITE/READ TEST	2
COMPLETE MEMORY BOARD FORMATTED WRITE/READ TEST	3
READ/VERIFY TEST 3 DATA AGAIN	4
WRITE UNFORMATTED DATA TO SELECTED MEMORY LOCATIONS	5
READ/VERIFY TEST 5 DATA AGAIN	6
READ LOCATIONS WHERE HARDWARE CAL DATA IS STORED	7
SHOW NON-VOLATILE MEMORY PARAMETERS	8
*RESET MEMORY TO DEFAULT HARDWARE CAL DATA	9
RETURN TO 85101 SERVICE PROGRAM MENU	F [.]

* - For factory use only.

TO RETURN TO THIS MENU AFTER COMPLETING A TEST, PRESS THE =MARKER KEY

ENTRY AREA
HEX KEYS



rr511c

8510C SERVICE PROGRAM MENU (LCD) (1 OF 2)

8510 SERVICE PROGRAM MENU

85101 DISPLAY/PROCESSOR SERVICE PROGRAM	1 (See prev. page)
85102 IF/DETECTOR SERVICE PROGRAM	2
TEST SET GPIB SERVICE PROGRAM	3
8360 SERVICE PROGRAM	4
RETURN TO MAIN SERVICE FUNCTIONS MENU	F (see note 1)

NOTES: (1) Hex digits A thru F are assigned to [G/n], [M/u], [k/m], [X1], [+/−], and [.] respectively.

(2) To make a selection, type the number indicated, then press =MARKER.

(3) The default value on data entry is zero.

Copyright © Agilent Technologies 1987, 2001

TEST SET GPIB SERVICE PROGRAM MENU

PRESET TEST SET	1
SWITCH ACTIVE LIGHT	2
*SWITCH PORT 1,2 LIGHTS	3
*ACTIVATE PORT 1,2 ATTENUATOR	4
*INCREMENT ACTIVE ATTENUATOR	5
SELECT NEW GPIB ADDRESS	6
RETURN TO 8510 SERVICE PROGRAM MENU	F [.]

* − For test sets with appropriate feature.

NOTES: (1) To repeat a function, press =MARKER.
(2) The default Test Set GPIB address is 20.

8360 SERVICE PROGRAM MENU

GPIB TEST	1
FRONT PANEL EMULATOR	2
CHANGE GPIB ADDRESS (default is 19)	3
RETURN TO 8510 SERVICE PROGRAM MENU	F

On the 85102 rear panel, connect '20 MHz OUT' to 'J1 TEST SET INTERCONNECT' using the service adapter and a BNC cable. Also, connect 'ANALOG + − 10V' to 'SWEEP IN 0−10V' using another BNC cable. Failure to do so will result in false error messages.**

PRESS =MARKER TO CONTINUE . . .

** NOTE:
Disconnect BNC cables from 85102 to source when running tests. Failure to do so will result in false error messages.

85102 IF/DETECTOR SERVICE PROGRAM MENU

ADC CONTROL TEST (A19)	1
SWEEP ADC TEST (A20)	2
ADC TEST (A18)	3
CAL DAC TEST (A17)	4
100 kHz IF AMPLIFIER TEST (A10, A12)	5
SYNCHRONOUS DETECTOR TEST (A5, A7)	6
20 MHz MIXER TEST (A9, A11, A13, A14)	7
PRETUNE PHASE LOCK TEST (A22)	8
MAIN PHASE LOCK TEST (A23)	9
IF COUNTER TEST (A21)	A [G/n]
RUN ALL THE ABOVE TESTS ***	B [M/u]
85102 FRONT PANEL TEST	C [k/m]
RETURN TO 8510 SERVICE PROGRAM MENU	F [.]

NOTE: Always check cables leading to and from boards with suspected problems.

*** NOTE:
May fail tests 1 or 2 due to processor speed issue when running all tests. If tests 1 and 2 pass individually then assume the instrument is OK.

What's Wrong?

1. Do you have any self test failures, running error messages (beeping) or raw channel power (unratioed power) problems? = MAGIC QUESTION.
2. Failed performance tests?
3. Display or Front Panel abnormalities, measurement errors, or display hang-ups?
4. Low or no power symptoms?

Do a Pre-Operational Check of the 8510XF System

Check Front and Rear Panel control settings, cables and GPIB addresses. Check the 85101 free run switch on the A5 Processor Board (all zeros), and proper firmware revisions for source and 8510XF (you may need to reload the Operating System in an extreme case). Check that the 8510XF firmware is XF.01.00 or greater.

First, turn on the Sources, then the Test Set, then the 8510XF, or the system cabinet power switch. Then check all troubleshooting LED's. See the 8510XF system level troubleshooting block diagram for these LED's. See installation for additional information in performing the Preflight Checkout.

If NO Obvious Failure Type Prove 85101 is OK

Obvious Self-Test, running error, or unratioed power test failure. Refer to the 8510XF Service Manual, part number E7350-90001, Service and Troubleshooting.

No Obvious Failure Type

The best approach to repair the 8510XF at this point is to verify that the 85101C is good. Once it is known to be good, it will act as your diagnostic controller.

Remove the external controller, printer, etc. and the cables from the 8510XF system.

Run the 8510XF Service Program to verify that the 8510XF is OK to a 95% confidence level. To do this, run all the service program tests in the "85101C Display/Processor Service Program menu (#1)." These tests take about ten minutes. Refer to the 8510XF Service Program Flowchart. See partial flowchart on next page.

NOTE: the above tests can be skipped if the 85101C passes the power up 85101 self test. The self test has only a 70% confidence level, so use it accordingly.

To Sheet 2

Obvious Failure Type

Obvious Failure Type

Obvious Calibration or Verification Problem

Read the 8510XF Calibration and Verification and Cable manuals on how to inspect, gage, clean, and use the calibration and verification devices, waveguide, and test port return cables. Make sure, if your 85059A Verification Kit has been certified to 110 GHz within the past year.

Obvious Software Problem

Try the backup standard software by reloading the Operating System firmware.

It might be a known software bug. See STARS bug report. Call the factory with details for checkout and duplication of unknown and new bugs!

Obvious Power Supply Problem

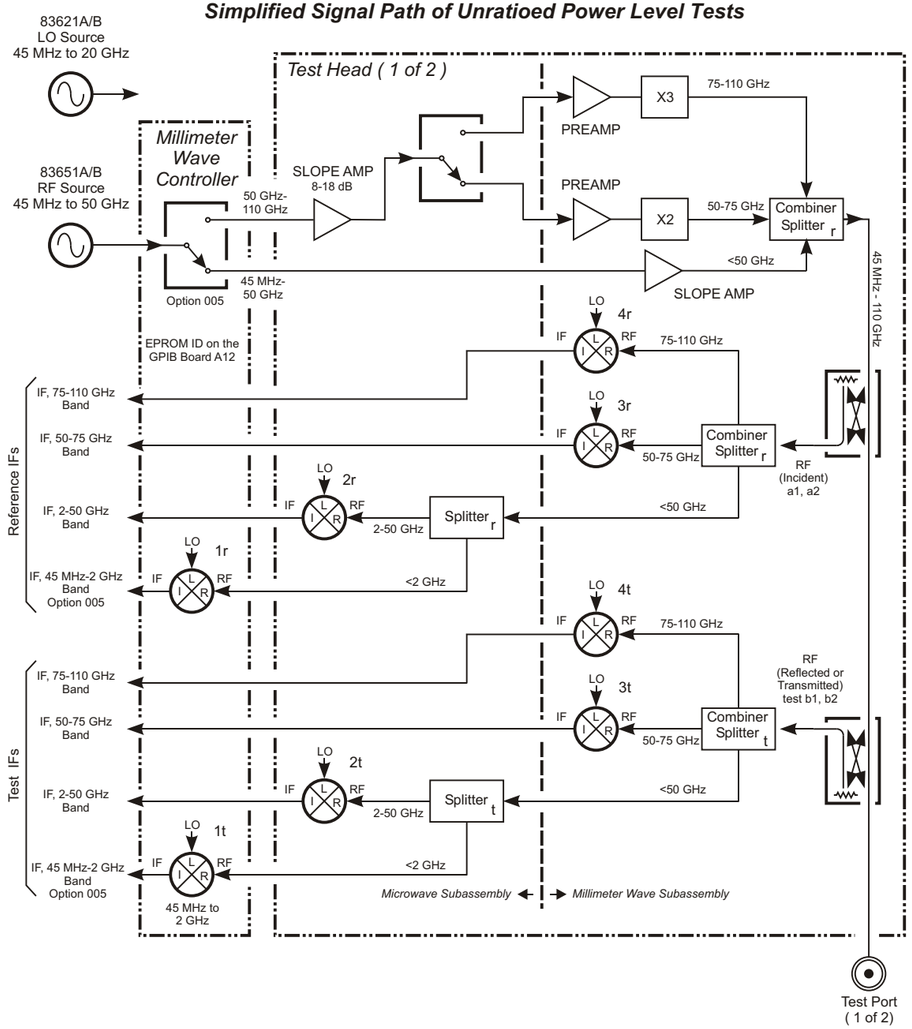
CHECK POWER SUPPLIES

Check all main (110V/220V) fuses and power switches. Remove 85101, 85102 and E7342A/52A instrument covers and check LED power and service indicator lights. Recheck by measuring each power supply voltage with a DVM.

The 85102 power switch LED is supplied by the +5V supply in the 85101.

Refer to Qualified Personnel Only!

Simplified Signal Path of Unratioed Power Level Tests



85101 is OK

NOTE: From this point, the problem is probably one of the remaining instruments; the 85102, sources, test heads, the mm-wave controller or their interfaces.

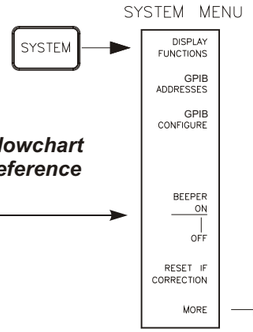
You can use the 8510XF, power-up self tests, running error messages, a1, a2, b1, and b2 raw channel displays, troubleshooting LED's, and passed installation data and displays to help pinpoint the problem to an instrument. But, with the diagnostic aids that are now available for the 8510XF, the quickest way to isolate a problem to an instrument is using the technique of instrument substitution using the diagnostic aids as follows:

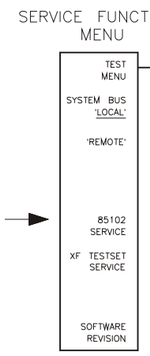
From Sheet 1

Prove 85102 is OK

To prove that the 85102 is OK, run the built-in 85102 IF/Detector Service Program Number 2. This verifies that the 85102 is good to an 80% confidence level. It takes less than a minute to run and pinpoint failures to a board.

Partial Flowchart Quick Reference





Main Service Functions Menu

Looping Self Tests

1 A5 Processor Eprom
2 A5 Processor Ram
3 A7 Data Bus
4 A4 Display Processor
5 A4 Display Ram
6 A7 Timer/Clock/RS-232
7 A7 Public HP-IB
8 A7 System Bus
9 Interrupt System
10 A5 Multiplier
11 A7 Disk Controller
12 A6 Non-Volatile Memory
13 IF Detector Data
14 Keyboard

System Commands

15 Run Main Program
16 Memory Operations
17 Rerun Self Test
18 Repeat Test Loop

Disk Commands

19 Load Program Disk
20 Record Program Disk
21 Initialize Disk

Service Commands

22 Run Service Program
23 Diagnose a Failure

ENTER selection, then press =MARKER

8510 Service Program Menu

85101 Display/Processor Service Program	1
85102 IF/Dectector Service Program	2
Test Set GPIB Service Program	3
Return to Main Service Functions Menu	F[,]

NOTES:
1. Hex digits A thru F are assigned to [G/n], [M/u], [k/m], [X1], [+/-], and [.] respectively.
2. To make a selection, type the number indicated, then press =MARKER.
3. The default value on data entry is zero.

copyright © Agilent Technologies 1987, 1988, 1990, 1998, 2000

85101 Display/Processor Service Program Menu

CPU Board Tests (A5)	1
I/O Board and Front Panel Tests (A1, A2, A7)	2
Display Board and CRT Tests (A4, A11)	3
Non-Volatile Memory Board Tests (A6)	4
Return to 8510 Service Program Menu	F [,]

85102 is OK

(20 minute test)
To prove that the E7342A/52A Millimeter Sub-Systems are at fault use the part number 85102-60210 5-way power splitter. This substitutes for the mm-wave controller test heads and sources and proves whether they are at fault. Also run the 8510C Service Program Menu number 3.

Finally, perform the RF Source built-in diagnostics and the E7342A/52A un-ratioed power troubleshooting. Refer to the Operator's Check , and perform this check to troubleshoot the un-ratioed power levels. This tests the RF Sources mm-wave controller and test heads. This verifies that the RF Source, mm-wave controller and test heads are operating to a 90% confidence level.

If All Four Channels are OK, the 8510XF is OK and You are Done!

If All Four Channels Fail the Unratioed Power Level Tests

If all four channels fail the Unratioed Power Level Tests, the most likely causes are a failure in the RF or LO Sources signal going to the Controller test head and associated cables that effect all four channels (see LO path and RF path). A Power Supply can also cause these paths to fail.

Remove the GPIB and RF power cables from the 8510XF system to isolate the sources. Refer to the appropriate source manual to troubleshoot the 83651B and 83621B. For 8360 series sources use the front panel emulator 08510-60022.

NOTE: Do not try to measure the RF source power in source #1 in the 8510XF system by disconnecting the RF cable. Measuring the RF from the source breaks the leveling loop and causes the source to supply maximum power output. Instead, try placing a coupler in the RF cable path and measure the power that way. Consider substituting known good sources and cables for the suspected sources, if they are available.

If One, Two, or Three Channels Fail the Unratioed Power Tests

If One, Two, or Three Channels Fail the Unratioed Power Tests. If the power levels on at least one but not all of the four channels fail, the most likely cause of failure is the test head or mm-wave Controller. See E7342A/52A manual for service procedures for they are manual procedures and cannot be abbreviated here.

Below describes how test set manual works for the 8510XF. To help narrow the problem to the faulty instrument, the service adapter and service tools are used to emulate the operation of the source and test set and check unratioed power levels into the 85102 IF/Detector.

Run the Service Program using the Test Set GPIB commands tests. These tests can find approximately 15% of all E7342A/52A mm-wave Controller failures and requires about one minute to complete. The digital functionality of the mm-wave Controller is checked with this test, not the RF paths. Finally, use the failed unratioed power test to find the bad path/paths and assembly.

NOTE: Do not perform Test number 5 "Increment Active Attenuator" in the "Test Set GPIB Commands" menu. The mm-wave Controller does not contain any attenuators.

HOW TO READ THIS BLOCK DIAGRAM:

THIS DIAGRAM SHOWS A T PICAL 851OXF S STEM CONFIGURATION. NOTE THAT THE CIRCUIT BOARDS AND ASSEMBLIES HAVE NUMBERS PRECEDED B THE LETTER 'A', THAT NUMBER IDENTIFIES THE ASSEMBL . THE OTHER NUMBERS REFER TO THE LIST ON SHEET 2.

USE THIS BLOCK DIAGRAM AS A UICK REFERENCE GUIDE TO S STEM FAILURES AS WELL AS A GUIDE TO LED LOCATION AND MEANING. TEST SET ADDRESS AND CONFIGURATION SWITCH SETTINGS ARE ALSO SHOWN.

NUMBERS 1 – 14

THESE NUMBERS IDENTIF THE SELF TEST THAT EXERCISES THE PARTICULAR ASSEMBL , MOSTL ON THE 85101 DISPLA /PROCESSOR. FOR MORE INFORMATION, REFER TO 'SELF' TEST FAILURES IN THE ON – SITE SERVICE MANUAL.

NUMBERS 15 – 36

THESE NUMBERS IDENTIF THE BUILT – IN RUNNING ERROR MESSAGE THAT WILL APPEAR ON THE 8510I CRT IF A S STEM FAILURE IS DETECTED. MOSTL ON THE 85102 IF/DETECTOR, TEST SET, AND SOURCE. THE NUMBERS IDENTIF THE ASSEMBLIES WHERE THE ERROR IS DETECTED OR GENERATED. FOR MORE INFORMATION, REFER TO 'RUNNING ERROR MESSAGES' IN THE ON – SITE SERVICE MANUAL.

NUMBERS 37 – 41

THESE NUMBERS IDENTIF RUNNING ERROR MESSAGES ASSOCIATED WITH 8360 – SERIES SOURCES ONL AND APPEAR ON THE 85101 CRT.

NUMBERS 42 – 45

THESE ARE EXTRA TROUBLESHOOTING

TEST SET DEFAULT SETTINGS: Option 006.

THE DEFAULT STATE OF THE 8517A/B TEST SETS (TURN POWER OFF, PULL A4 GPIB BOARD AND TURN POWER BACK ON) IS TO HAVE ALL SAMPLERS ENABLED, A14'S VTO BIASED ON, PORT 1 AND 2 ATTENUATORS AT 0dB, AND THE SWITCH SPLITTER APPL ING RF POWER TO PORT 1.

UNI UE TOOLS
TORX DRIVER T-10 8710-1623 (For Chassis)
TORX DRIVER T-15 8710-1622 (For Chassis)
ALLEN WRENCH 6 = 1/16 IN. 5020-0289 (For RPG Knob)

Self Test Indicators for Millimeter Wave Controller GPIB Board

If the ACTIVE LED on the Front Panel does not light within two seconds of turn on, or lights immediately, the test has not passed it s Self Test. ou can determine what part of the Self Test failed by determining which GPIB LEDs on the A12 Assembly are lit. The Table below shows the possible Self Test failures.

Self Test Indication	A12 GPIB LEDs				Elapsed Time After Turn-On (in seconds)
	LSN	TLK	SRQ	REM	
PWON	ON	ON	ON	ON	0 to 0.5
Fail ROM Test	OFF	ON	ON	ON	ON Briefly
Pass ROM Test	OFF	OFF	ON	ON	0.52 to 2.0
Fail RAM Test	OFF	OFF	OFF	ON	
Pass RAM Test	OFF	OFF	OFF	OFF	After 2 sec.

Two seconds after turn-on all four GPIB LEDs should go OFF, and the Front Panel ACTIVE LED should light simultaneously. After going out briefly, the two GPIB LEDs will light according to the state of the Test Set. If you are using multiple Test Sets, the first Test Set in line will be the active Test Set until another is chosen.

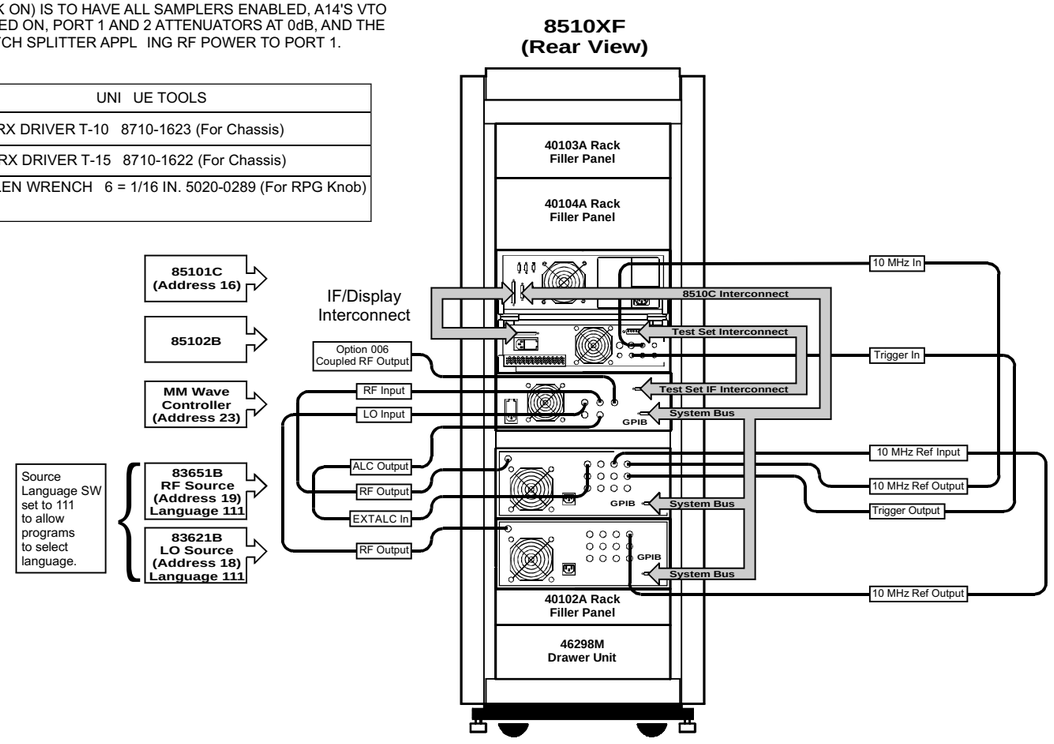
If Self Test Fails to Run

If the portion of memory which contains the Self Test programming is faulty, the Self Test will not run properly. The following conditions indicate that the Self Test ROMs are faulty:

- All LEDs flash briefly and go OFF
- All LEDs flash briefly and stay ON
- ACTIVE LED goes ON before GPIB LEDs go OUT
- ACTIVE LED does not go ON at all (check LED operation before proceeding)

TOR UE WRENCHES		
8 in-lbs	20 mm	8710-1764
8 in-lbs	5/16 in	8710-1765
4 in-lbs	6 mm	8710-2079

8510XF (Rear View)



When changing A16: Save EE PROM from old A16 leveling DAC board to retain calibration constants.

83621A/B LO Source 45 MHz to 20 GHz

GPIB System Bus

10 MHz REF

83651A/B RF Source 45 MHz to 50 GHz

Trigger IN

GPIB System Bus

10 MHz REF

Millimeter Wave Controller

Option 005

Regulator Board 9 Power Supply LEDs for ALL Power Supplies

5V LED Front Panel Power Switch

GPIB System Bus

Test Head (1 of 2)

50 MHz-110 MHz

45 MHz-50 GHz

SLOPE AMP 8-18 dB

PREAMP

X3

75-110 GHz

PREAMP

X2

50-75 GHz

Combiner Splitter r

50 GHz

SLOPE AMP

45 MHz - 110 GHz

LO 4r

IF RF 75-110 GHz

LO 3r

IF RF 50-75 GHz

Combiner Splitter r

RF (Incident) reference a1, a2

50 GHz

LO 2r

IF RF 2-50 GHz

Splitter r

DS7 and DS9 LEDs (ellow)
45 MHz to 50 GHz Both ON DS7 and DS9
50 GHz to 75 GHz DS7 OFF DS9 ON
75 GHz to 110 GHz DS9 OFF DS7 ON

LO 1r

IF RF 2 GHz

IF, 45 MHz-2 GHz Band Option 005

GPIB Board 4 LEDs

LO 4t

IF RF 75-110 GHz

RF (Reflected or Transmitted) test b1, b2

LO 3t

IF RF 50-75 GHz

Combiner Splitter t

LO 2t

IF RF 2-50 GHz

Splitter t

50 GHz

LO 1t

IF RF 2 GHz

45 MHz to 2 GHz

Reference IFs

IF, 75-110 GHz Band

IF, 50-75 GHz Band

IF, 2-50 GHz Band

IF, 45 MHz-2 GHz Band Option 005

Test IFs

IF, 75-110 GHz Band

IF, 50-75 GHz Band

IF, 2-50 GHz Band

IF, 45 MHz-2 GHz Band Option 005

Microwave Subassembly Bias Boards and Power Supply LEDs for all Power Supplies

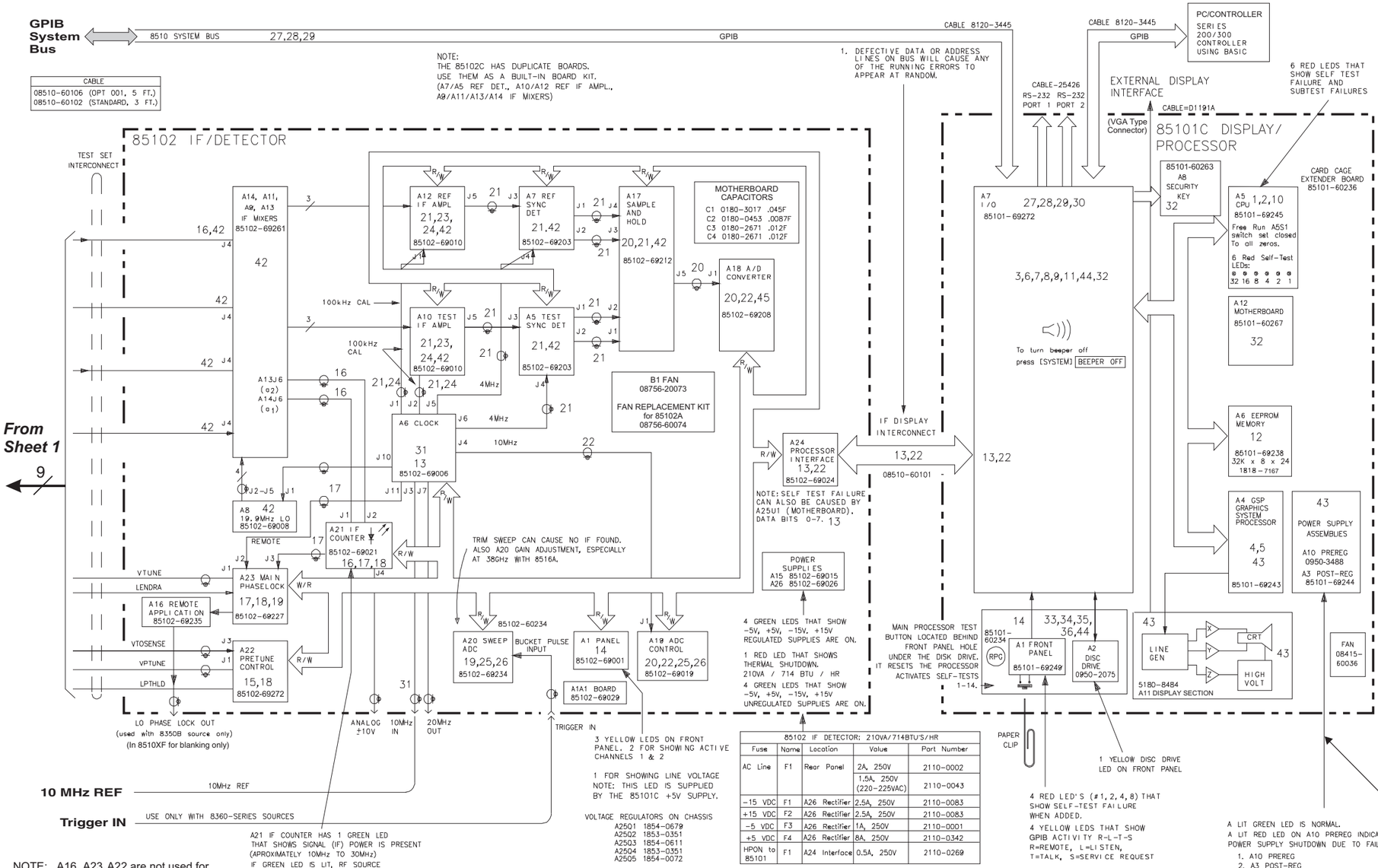
Millimeter Wave Subassembly +/- 7 Volt ON LED Front Panel

* *Connector - Test Port 1mm M/F (part number 85104 - 60061)*

Test Port * (1 of 2)

9 *To Sheet 2*

Self Test (1-14), Running Error Messages (15-41), Unratioed Power Test (42), LEDs/GPIB Addresses/Configuration Switch Settings



85102 IF DETECTOR: 210VA/714BTU'S/HR				
Fuse	Name	Location	Value	Part Number
AC Line	F1	Rear Panel	2A, 250V	2110-0002
			1.5A, 250V (220-225VAC)	2110-0043
-15 VDC	F1	A26 Rectifier	2.5A, 250V	2110-0083
+15 VDC	F2	A26 Rectifier	2.5A, 250V	2110-0083
-5 VDC	F3	A26 Rectifier	1A, 250V	2110-0001
+5 VDC	F4	A26 Rectifier	8A, 250V	2110-0342
HPON to 85101	F1	A24 Interface	0.5A, 250V	2110-0269

85101 DISPLAY/PROCESSOR: 250VA/850BTU'S/HR				
Fuse	Name	Location	Value	Part Number
	A3F1		1.5A 125V	2110-0333
	A3F2		2A 125V	2110-0425
	A3F3		2A 125V	2110-0425
	A10F1		3.15 A 250V	2110-0655

SELF TESTS

1. A5 PROCESSOR EPROM (self test and service program PROM using checksum)
2. A5 PROCESSOR RAM (test processor memory using data complement technique)
3. A7 DATA BUS TEST (test I/O data bus)
4. A4 DISPLAY PROCESSOR
5. A4 DISPLAY RAM
6. A7 TIMER/CLOCK/RS – 232
7. A7 PUBLIC GPIB (Read/Write test of GPIB register)
8. A7 SYSTEM BUS (Read/Write) test of system bus register)
9. INTERRUPT SYSTEM (test interrupts)
10. A5 MULTIPLIER (PERFORMS a complex multiply)
11. A7 DISC CONTROLLER
12. A6 NON-VOLATILE MEMORY TEST (read/write test)
13. IF DETECTOR DATA (read/write test data and address lines)
14. KEYBOARD (read 85101C keyboard for a stuck key)

RUNNING ERROR MESSAGES

15. FAILED PRETUNE/LOST PRETUNE
16. NO IF FOUND
17. PHASE LOCK FAILURE
18. PHASE LOCK LOST
19. VTO OVER-RANGE
20. ADC CAL FAILED
21. IF CAL FAILED – REFERENCE;
    IF CAL FAILED – TEST;
    IF CAL FAILED – BOTH (channels)
22. ADC NOT RESPONDING
23. IF OVERLOAD (External level of 8360 can cause this.)
24. AUTORANGE CAL FAILED
25. SOURCE SLEEP SYNC ERROR
26. SWEEP TIME TOO FAST
27. SOURCE (GPIB) SYNTAX ERROR
28. TEST SET (GPIB) SYNTAX ERROR
29. SYSTEM BUS ADDRESS ERROR
30. SYSTEM BUS SRQ ERROR
31. UNABLE TO LOCK TO EXT 10 MHz REF
32. ERROR: SYSTEM KEY NOT INSTALLED; CAUSED BY SECURITY KEY MISSING, BAD I/O, BADA8 CONNECTOR, BAD MOTHER-BOARD.
    CAUTION: OPTIONAL FUNCTION: NOT INSTALLED
    CAUTION: TIME DOMAIN KEY NOT INSTALLED
33. DISC HARDWARE PROBLEM
34. DISC COMMUNICATION ERROR
35. INITIALIZATION FAILED
36. DISC MEDIA WEARING OUT - REPLACE SOON

8360 – SERIES SOURCES RUNNING ERROR MESSAGES

37. FAILURE – FAULT INDICATOR ON
38. FAILURE – RF UNLOCKED
39. FAILURE – OVERMODULATION
40. FAILURE – SELF TEST FAILURE
41. INVALID SETUP – CHECK SYSTEM BUS CONFIGURATION

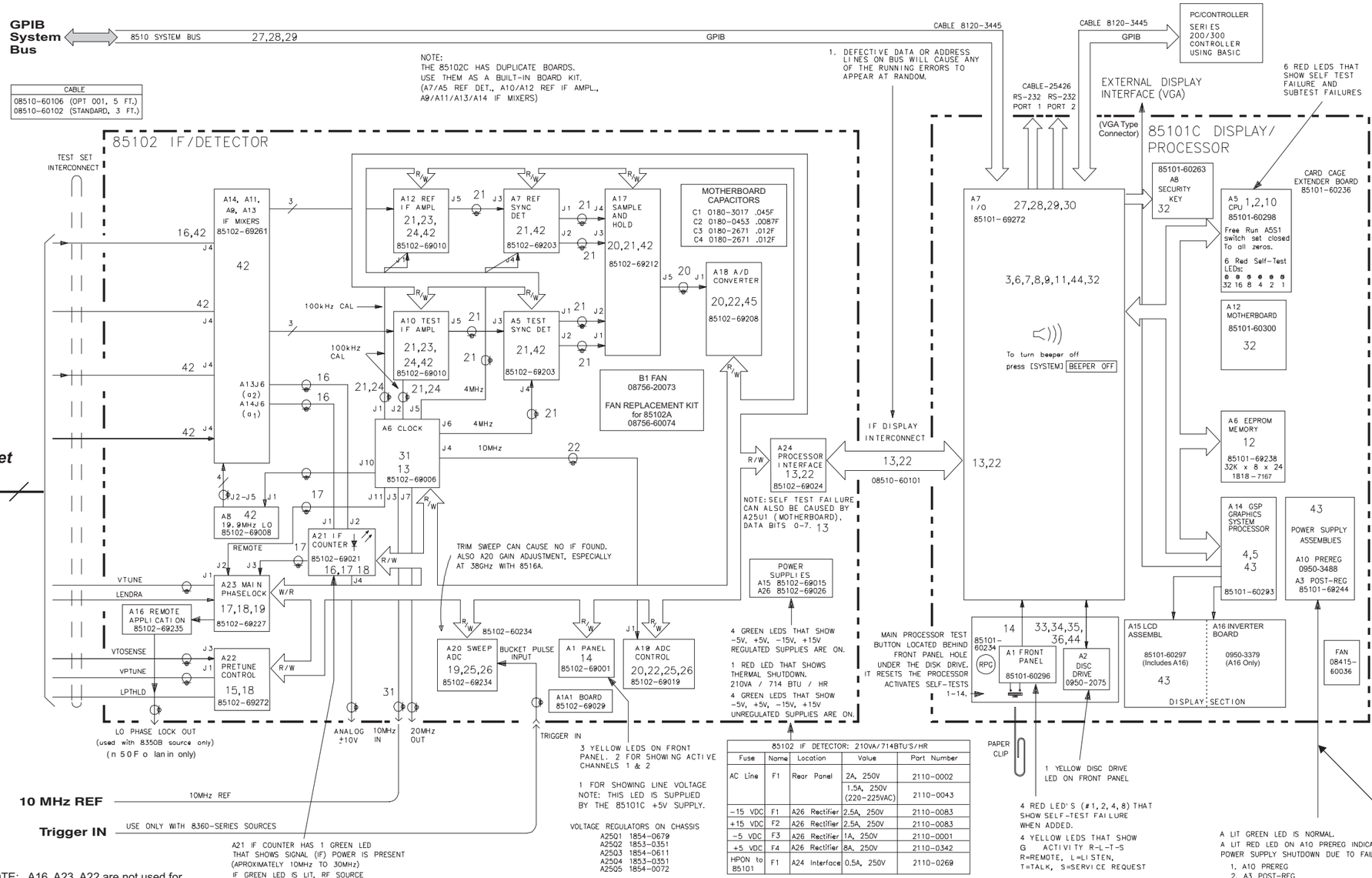
OTHER TROUBLESHOOTING HINTS

42. Perform the unratioed power test for a1, a2, b1, and b2. Refer to 'System Maintenance, Troubleshooting' in the 8510XF Operating and Service Manual, E7350-90001.
43. The A4 GSP and the A11 display must be working in order for a normal display to be on the CRT.
44. If self test 11 passes, try to initialize a blank disc to further test the A2 disc drive.
45. A18 (85102) ANALOG TO DIGITAL CONVERTER TEST
    When you first turn the instrument ON, if the noise on the trace is greater than 1 dB, then the A18 board may be faulty.

    If you cycle the AC power (Off, then On), the noise may disappear. If it does, there is probably a malfunction with the A18 A/D board although no apparent symptoms are present. There also may be no Running Error Messages, Self Test Failures or Service Program test failures.

    If this trace noise disappears when the POWER is cycled, the test has FAILED and the A18 board should be REPLACED.

Self Test (1-14), Running Error Messages (15-41), Unratioed Power Test (42), LEDs/GPIB Addresses/Configuration Switch Settings



85102 IF DETECTOR: 210VA/714BTU'S/HR				
Fuse	Name	Location	Value	Part Number
AC Line	F1	Rear Panel	2A, 250V	2110-0002
			1.5A, 250V (220-225VAC)	2110-0043
-15 VDC	F1	A26 Rectifier	2.5A, 250V	2110-0083
+15 VDC	F2	A26 Rectifier	2.5A, 250V	2110-0083
-5 VDC	F3	A26 Rectifier	1A, 250V	2110-0001
+5 VDC	F4	A26 Rectifier	8A, 250V	2110-0342
HPON to 85101	F1	A24 Interface	0.5A, 250V	2110-0269

85101 DISPLAY/PROCESSOR: 250VA/850BTU'S/HR				
Fuse	Name	Location	Value	Part Number
	A3F1		1.5A 125V	2110-0333
	A3F2		2A 125V	2110-0425
	A3F3		2A 125V	2110-0425
	A10F1		3.15 A 250V	2110-0655

NOTE: A16, A23, A22 are not used for 8510XF operation that is, phase lock none, except for some signal transfers from LPTHLD, etc.

SELF TESTS

1. A5 PROCESSOR EPROM (self test and service program PROM using checksum)
2. A5 PROCESSOR RAM (test processor memory using data complement technique)
3. A7 DATA BUS TEST (test I/O data bus)
4. A14 DISPLA PROCESSOR
5. A14 DISPLA RAM
6. A7 TIMER/CLOCK/RS – 232
7. A7 PUBLIC GPIB (Read/Write test of GPIB register)
8. A7 S STEM BUS (Read/Write test of system bus register)
9. INTERRUPT S STEM (test interrupts)
10. A5 MULTIPLIER (PERFORMS a complex multiply)
11. A7 DISC CONTROLLER
12. A6 NON-VOLATILE MEMOR TEST (read/write test)
13. IF DETECTOR DATA (read/write test data and address lines)
14. KE BOARD (read 85101C keyboard for a stuck key)

R NNING ERROR MESSAGES

15. FAILED PRETUNE/LOST PRETUNE
16. NO IF FOUND
17. PHASE LOCK FAILURE
18. PHASE LOCK LOST
19. VTO OVER-RANGE
20. ADC CAL FAILED
21. IF CAL FAILED – REFERENCE
    IF CAL FAILED – TEST
    IF CAL FAILED – BOTH (channels)
22. ADC NOT RESPONDING
23. IF OVERLOAD (External level of 8360 can cause this.)
24. AUTORANGE CAL FAILED
25. SOURCE SLEEP S NC ERROR
26. SWEEP TIME TOO FAST
27. SOURCE (GPIB) S NTAX ERROR
28. TEST SET (GPIB) S NTAX ERROR
29. S STEM BUS ADDRESS ERROR
30. S STEM BUS SR ERROR
31. UNABLE TO LOCK TO EXT 10 MHz REF
32. ERROR: S STEM KE NOT INSTALLED CAUSED B SECURIT
    KE MISSING, BAD I/O, BAD A8 CONNECTOR, BAD MOTHER-BOARD.
    CAUTION: OPTIONAL FUNCTION: NOT INSTALLED
    CAUTION: TIME DOMAIN KE NOT INSTALLED
33. DISC HARDWARE PROBLEM
34. DISC COMMUNICATION ERROR
35. INITIALI ATION FAILED
36. DISC MEDIA WEARING OUT - REPLACE SOON

83 0 – SERIES SO RCES R NNING ERROR MESSAGES

37. FAILURE – FAULT INDICATOR ON
38. FAILURE – RF UNLOCKED
39. FAILURE – OVERMODULATION
40. FAILURE – SELF TEST FAILURE
41. INVALID SETUP – CHECK S STEM BUS CONFIGURATION

OTHER TRO BLESHOOTING HINTS

42. Perform the unratioed power test for a1, a2, b1, and b2. Refer to 'System Maintenance, Troubleshooting' in the 8510XF Operating and Service Manual, E7350-90001.
43. The A14 GSP and the A15 display must be working in order for a normal display to be on the LCD.
44. If self test 11 passes, try to initialize a blank disc to further test the A2 disc drive.
45. A18 (85102) ANALOG TO DIGITAL CONVERTER TEST
    When you first turn the instrument ON, if the noise on the trace is greater than 1 dB, then the A18 board may be faulty.
    If you cycle the AC power (Off, then On), the noise may disappear. If it does, there is probably a malfunction with the A18 A/D board although no apparent symptoms are present. There also may be no Running Error Messages, Self Test Failures or Service Program test failures.
    If this trace noise disappears when the POWER is cycled, the test has FAILED and the A18 board should be REPLACED.